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AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

DECEMBER, 1829.

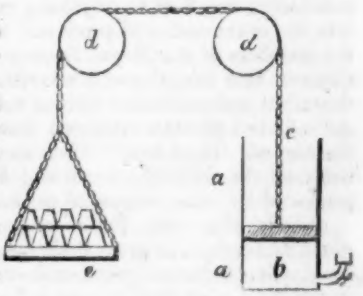
On the Early History of the Steam Engine.

[Concluded from p. 327.]

To proceed with the historical series, it may be mentioned, that about this time Otto Guericke was engaged in those experiments and speculations which led to the invention of the air-pump,—to a better knowledge than had hitherto been obtained of the air's weight and elasticity, and, particularly, of the powerful effects of that weight and elasticity when excited by an exhausted, or partially exhausted, space.

Otto Guericke, in his work on the subject, published in 1672, describes numerous contrivances for exhibiting, or using mechanically, the weight of the air. One apparatus he describes similar to that in *Fig.* 8, where *a*, *a*, is a cylinder, to which is fitted a piston, *b*, attached to a chain, *c*, which passes over the pulleys, *d*, *d*, and supports a loaded scale, *e*. A pipe, *f*, enters the cylinder near the bottom, and to this pipe a pump is to be attached, by whose means the air may be withdrawn from the lower part of the cylinder, which will, of course, cause the piston to be forced downwards by the unbalanced pressure of the atmosphere. In this way Gue-

Fig. 8.



ricke says that a boy of twelve or fifteen years old, acting on the pump at *f*, may raise a weight, however large, in the scale *e*, provided only that the diameters of the pump and the cylinder, *a*, be properly proportioned.

This, it will be perceived, is an anticipation of the principle of Bramah's hydrostatic press; not that it at all interferes with the credit due to Mr. Bramah for that beautiful invention, because he claimed no discovery of new principles, but a better application of those which were old.

In this apparatus of Otto Guericke, which is fully described by a very large picturesque engraving in his work of 1672, we have a complete explanation of the principle of obtaining power from a vacuum formed under a moveable piston. It is quite clear, also, that the mode of producing a vacuum, by means of condensed steam, was known and published at this time. If, therefore, any one had proposed to Guericke, to make the vacuum by condensing steam, instead of by a pump, there would be no vast stretch of ingenuity in the suggestion. But suppose Guericke to reply, "how shall I apply the steam?" Imagine, then, that he is thus answered:—"place a little water in the bottom of the cylinder, then set the cylinder on a fire till the water is converted into steam, and the piston is at the top; secure the piston from descending, and carry the whole apparatus to wherever the work is to be performed, then fix the cylinder, attach the piston to the point where your power is to be applied, and as the cylinder cools, your work will be done." If Otto Guericke were a man of business, he would reply, this will cost about ten times as much as exhausting the cylinder by hand. So that this suggestion, besides possessing the smallest possible quantity of originality, would have the property of being utterly inapplicable to useful or economical purposes.

About the year 1685, Monsieur Papin communicated to the Royal Society and others, various devices for using compressed and rarefied air to elevate water in jets or pipes. In none of these is there a particle of novelty, as will be evident to whoever will compare them with the works of Hero and his translators. He contrived an apparatus of this sort, which he decorated and placed as an ornament on his chimney shelf, but he concealed within the shelf a pipe communicating with an adjoining room, through which air was forced into the ornament, and produced a jet of water. This he invited the members of the Royal Society to see, and challenged them to discover how the jet was produced. The mysterious ornament was described and published without reference to the concealed pipe, and some foolish persons imagined that the perpetual motion had been discovered; till at length Monsieur Papin disclosed, what it is probable all the scientific world had long known,—that the effect was produced by some concealed artifice.

Shortly after this, Papin proposed to convey motion from one place to another, at great distance, by means of air-tight tubes communicating between cylinders containing pistons. He thought that, in this way, a motion in one cylinder could be transferred to an-

other at the distance of a mile or more. This is something like the scheme which has been lately before the public, of starting a carriage from London by means of an air-pump at Brighton.

Any person who could seriously propose to work a piston in a cylinder at one end of Oxford street by means of an air-pipe, communicating with a second cylinder at the other end, must be ignorant of what ought at that time to be fully known, namely, that air was inert like other matter; that it was elastic, and that in pipes its motion was retarded by friction.

In 1669, Papin copied Otto Guericke's contrivance, and describes it as his own invention; whereas the only change he makes, is in causing the descent of the piston to express oil from seeds instead of raising a weight. This is a mere plagiarism.

From about 1685 to 1700, therefore, it appears that Monsieur Papin was engaged in forming contrivances to employ the force of exhausted or compressed air upon pistons in cylinders.

In 1688 he suggested the use of gunpowder to form the vacuum by its explosion, and in 1690 he proposed to form the vacuum by steam from a small quantity of water placed in the cylinder.

In *Fig.* 9, the cylinder of Papin is described; *a* is the piston, and *b* is a rod attached to it. There is a notch in the rod just above the piston, into which a catch, fixed on the top of the cylinder, enters, and retains the piston at the upper end till the catch is released. The tube, *c*, permits the escape of the air when the instrument is first used. The fire is brought under the cylinder, and retained there till the water is converted into steam, and the piston driven up. The piston is then secured by the catch, the fire is removed, the cylinder gradually cools, and at length the piston, being set at liberty, descends under the pressure of the air.

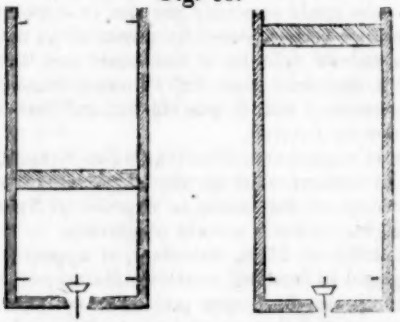
Fig. 9.

This is the apparatus on which M. Arago founds the completion of the claim of France to the honour of having invented the steam engine. It was never made as a working machine, and it does nothing more than illustrate a well known physical fact. That a vacuum was left by condensed steam, was known from the time of Hero at least. That the air, or some other power, would force a liquid or solid body into vacuum, was equally well known.

But let us see how M. Arago treats this matter. The section introducing this subject is headed "Denis Papin," and immediately under are placed the two diagrams, *Fig.* 10, which the reader, of course, concludes are the portraits of Papin's invention. But it will hardly be believed they are nothing of the sort; they are portraits of the apparatus of the Englishman, Newcomen, made fifteen years afterwards. M. Arago gives six pages of description of this apparatus, in which he brings the steam into the cylinder from a boiler through the valve, *a*, and which he says is very clearly described in the Leipsic Acts for 1688, and in a work of Papin's in 1695; and

he details certain experiments made with a cylinder which weighed five ounces.

Fig. 10.



At the bottom of the sixth page M. Arago proceeds: "The water which furnished the steam in these *first* experiments was not contained in a separate boiler—it had been placed in the body of the cylinder, upon the metal disk which closed the lower end. This disk Papin warmed to convert the water into vapour; and it was the same disk which cooled when the fire was removed in order to produce the condensation." From this we conclude that, as the apparatus described by M. Arago was not that used by Papin in his *first* experiment, of course it must be the apparatus used in Papin's second, or third, or last experiments. Nothing, however, would be more erroneous than such a conclusion. Papin never experimented on such an apparatus as M. Arago ascribes to him, he never even suggested such a one.

It is for the reader to judge of the fairness of ascribing to Papin in 1690 the invention of Newcomen made in 1705, without the slightest hint that such a substitution has been made. M. Arago thus sums up his notice of Papin:—

"Papin was the first to imagine a steam engine with a piston.

"Papin was the first who saw that aqueous vapour furnished the means of obtaining a vacuum in a *large space* (grande capacité.)

"Papin was the first who thought of combining in the same fire machine, the action of elastic vapour with the property of the same vapour to become condensed by cold."

If Papin's apparatus be a steam engine, he is entitled to such a share in the invention of that agent, as appears due to the novelty of his contrivances, and to their practicability. The reader may easily judge of each.

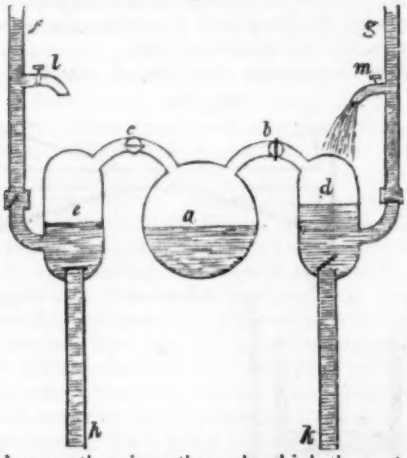
Papin was not the first by two thousand years who saw that condensed aqueous vapour left a vacuum. What differences there are between large and small spaces in this respect remain to be shown. The capacity of a five-ounce cylinder hardly deserves to be called a large space.

Papin's apparatus does not use both the elastic force and conden-

sation of the steam; and if it had, he was not the first who combined in the same machine the elastic force of the vapour and its condensibility; for Hero's apparatus does the same thing.

We proceed to the year 1699, when Mr. Savery exhibited to the Royal Society a model of the first engine, which is known to have been realized on the large scale. This model and its mode of action will be rendered intelligible by the diagram, *Fig.* 11, where *a* is a boiler communicating by the bent pipes *b* and *c* with the cold vessels

Fig. 11.



d and *e*: *f* and *g* are the pipes through which the water is forced out of the vessels by the steam, and *h*, *k*, are the pipes by which it enters these vessels from the well or cistern beneath. The arrangement of valves is precisely like that supposed in the Marquis of Worcester's, *Fig.* 7, and the only difference is, that here the cold water ascends into the vessels *d*, *e*, instead of flowing from the same level, and that the cooling of the vessels *d*, *e*, is hastened by suffering cold water to run upon them alternately from the cocks *l*, *m*. This last contrivance, the artificial condensation, is the only point of complete novelty about Savery's machine. He has, however, the rare merit of combining several principles which had been merely suggested, in an apparatus which presented to the world, for the first time, an effectual working machine for raising water by fire.

But we must now hear M. Arago.

His section headed "Savery," thus begins: "We have no proof that Salomon de Caus ever constructed his steam engine;" I might say as much of the Marquis of Worcester. "That machine of Papin, in which the action of the vapour and its condensation are successively employed, was executed only on a small scale. The reader will form an exact idea of Savery's, if he recollects that of Salomon de Caus, and attends to the following considerations."

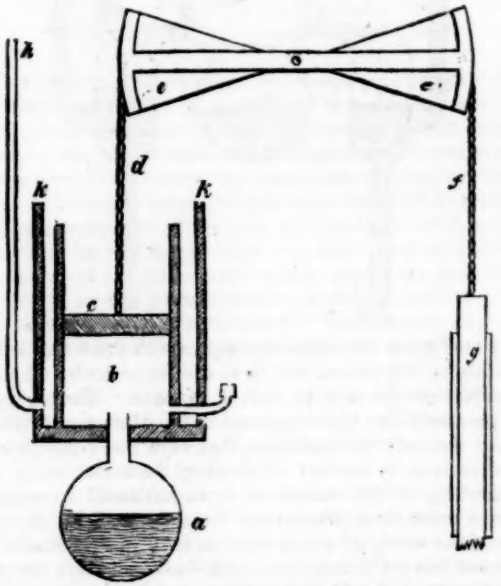
Thus the only description which M. Arago gives of the first work-

ing steam engine mankind ever saw, is by stating verbally, without any diagram, where it resembles and where it differs from what he calls the steam engine of Salomon de Caus. It will now be seen why M. Arago elongated the jet and valve of de Caus's diagram into indefinitely extended pipes; evidently for the purpose of assimilating them to the pipes *f*, *g*, *h*, and *k*, of Savery's engine.

In the year 1705, a patent was granted to Newcomen, Cawley, and Savery, for a steam engine, which was invented by the two former, and which was the first that ever became extensively useful; for Savery's was limited to inconsiderable heights, unless the vessels were subjected to dangerous pressures, and it was, moreover, very expensive in its consumption of coal.

The machine of Newcomen and Cawley, which is still partially

Fig. 12.



used where coals are cheap, consists of a boiler, *a*, from the upper part of which a pipe enters the bottom of the cylinder, *b*, in which works the piston, *c*, attached to the chain, *d*, whose upper end is fixed to one extremity of the beam, *e*, *e*. From the other end of the beam hangs the chain, *f*, supporting the pump rod, *g*. A communication is opened between the boiler and the cylinder by moving a valve; the steam enters the cylinder, and the piston is raised by the weight of the pump rods. When the piston is at the top of the cylinder, the communication between the boiler and cylinder is closed, cold water is then suffered to flow through the pipe, *h*, into an outer cylinder, or case, *k*, *k*, which surrounds the cylinder, *b*. The space

between the two is then filled with cold water, which rapidly condenses the steam under the piston, produces a partial vacuum, and causes the descent of the piston with a quantity of power proportioned to its area, the weight of the atmosphere, and the perfection of the vacuum.

This engine, after it had been so far completed as above described, cost the patentees seven years' labour and experience before it became an economical machine for draining. Notwithstanding that, according to M. Arago, a "proper machine for draining" had been in existence ever since the work of Salomon de Caus, in 1615; and notwithstanding that Papin had, in 1690, published (he says) "the most clear and methodical description of the engine known at present by the name of the Atmospheric Steam Engine."

The engine of Newcomen, which M. Arago admits to be the first that rendered any considerable services to industry, he describes as he does Savery's, without a diagram. He says, that "excepting some very essential details, it is nothing but the machine proposed in 1690 and 1695, by Papin." Excepting some very essential details, it is merely the machine of Hero. M. Arago never gives the slightest hint that he has put Newcomen's valve and boiler to Guericke's cylinder, and ascribed the combination to Papin; he says, that "both Papin and Newcomen produced the condensation by cold, though the English mechanic adopted a better plan of cooling for a working machine than that which had been employed by Papin in his model;" and he proceeds, "The machine of Papin thus modified as to the manner of cooling the aqueous vapour, excited to the highest point the attention of the proprietors of mines."

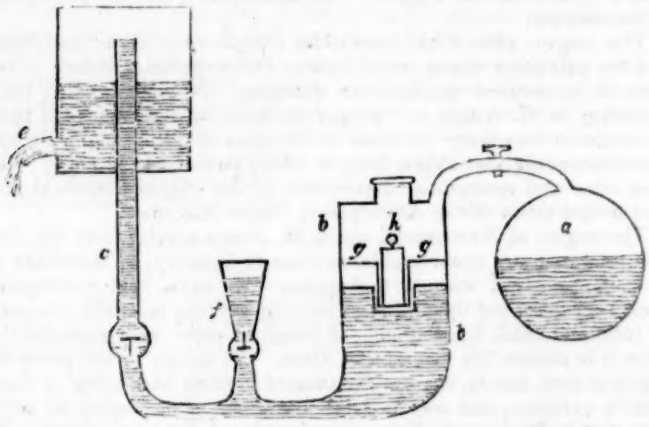
In this last paragraph there is not merely a continued suppression of the fact, that the apparatus described as Papin's is not Papin's, but Newcomen's; there is a direct assertion that the two machines differed only as to the manner of cooling the vapour.

The "modification" which M. Arago thus misrepresents as to its extent, and which he accounts of so little consequence, made all the difference between exciting the attention of proprietors of mines, and exciting no attention at all. Papin's steam cylinder lay unnoticed and undisturbed, and apparently forgotten, not only by the world, but by Papin himself; for no sooner had Savery succeeded in perfecting and realizing his machine, than Papin abandons his cylinder, seizes upon Savery's engine, mutilates it, and publishes it in 1707 as his own.

Fig. 13 describes this last and most palpable plagiarism, which Papin tells the Royal Society will so much increase the power of mankind, that he fears he shall be considered chimerical; he says further that it is much superior to the apparatus he had published some years before, and that he invented it without being aware of Savery's invention, which was (*he says*) not communicated to him till the year 1705. Papin omits the best part of Savery's apparatus, namely, the ascending pipes from the reservoir to the cold water vessels, and he claims this as an improvement. Thus he throws

aside the only part of the contrivance which modern engineers have been able to use with any regard to economy.

d Fig. 13.



The boiler, *a*, communicates with the cylinder, *b*, *b*, and the steam forces the water up the pipe, *c*, into the vessel, *d*, whence it escapes at *e*. The supply of cold water to be raised takes place at *f*. There is evidently not the slightest novelty in this machine so far; it is much beneath Savery's in every respect. It has, however, one novelty, from which a tolerably fair estimate of Papin's mechanical talents may be formed. The water in the cylinder, *b*, *b*, instead of being exposed to the steam, as in Savery's engine, is covered by a floating hollow piston of iron, *g*, *g*, supporting an iron heater, *h*, which is put in and taken out like the heater of a tea-urn. No two contrivances more absurd and wasteful than these were ever devised. The professed object of the hollow iron floater was to prevent the condensation of steam on the surface of the cold water. But even a hollow iron floater is a better conductor of heat than water, when the heat has to descend, and, therefore, the appendage is worse than useless. The iron heater to be put in and out at intervals is almost too ridiculous to notice, because, at the best, a certain quantity of heat applied in that manner could produce no greater effect than the same additional quantity applied to the boiler; while it is evident that the trouble of opening the cylinder, and exchanging the cold for the hot iron, together with the loss of heat in passing through the air, would more than destroy all that was gained. The whole contrivance is puerile in the extreme, and it is the work of Papin, of whom M. Arago says, "the man of genius is always misunderstood when he advances before his age."

The reader is now in possession of the stolen and disfigured child for which Papin deserted his former doubtful offspring, "the clear and methodical description of the Atmospheric Steam Engine;" and

it will now be easy to estimate the respective claims of Egypt, Italy, France, and England, up to the year 1707.

But in fact the steam engine was hardly yet invented. Newcomen's machine, though infinitely superior to every former contrivance, is a crude, imperfect, wasteful apparatus, in comparison with those which the following century brought forth. The engine up to this time is scarcely worth a dispute, even if it had been produced wholly by one man; but it is obviously the result of a succession of improvements so inconsiderable, that the whole of them do not exhibit a tenth part of the scientific and inventive resources which are displayed in the ameliorations effected by Watt alone. From the year 1705, the steam engine is confessedly a British invention. For all that is refined and economical in the development and application of the heat; for all that is ingenious in the machinery; for all that is vast in the power produced, and extensive in the purposes to which that power may be made subservient, it is notorious that the world is indebted to Great Britain. If, then, De Caus and Papin had done all that M. Arago so incorrectly ascribes to them, the great question would not be affected by it.

The reader who wishes to verify the statements here given, is referred to the "Acta Eruditorum Lipsiæ," from 1685 to 1700; to the "Philosophical Transactions" for the same period; to Papin's work, printed in 1695, at Cassel, and entitled "Recueil de diverses Pièces touchant quelques nouvelles Machines;" to Belidor's "Architecture Hydraulique" in 1725; to "Les Raisons des Forces Mouvantes," by Salomon de Caus, of which an edition, printed in 1624, is in the British Museum; to the various editions of Hero's "Spiritalia," and especially to the translation in 1606, by Porta, entitled, "I tre Libri Spiritalia," of which a copy is in the British Museum.

If any objection be made to the language here employed, in regard to a person entitled to so much respect as M. Arago, it must be recollected that the paper of that gentleman is an indiscriminating attack on the motives of several of the most distinguished individuals of the United Kingdom, not all of whom have given as much cause for suspicion as any one of the misquotations in the paper of M. Arago.

In page 176 of that paper, M. Arago says, "the greater part of the English authors," among whom he includes by name Dr. Robison and Dr. Lardner, "obstinately persist in quoting only one work of Papin, that of 1707, and refuse to take any notice of the more voluminous work of 1695."

The persons thus accused have at least the same excuse which M. Arago requires for neglecting Baptista Porta, with this additional circumstance in their favour, that they quote Papin's *latest*, and, according to his own account, his *best* contrivance, and that what they *do* quote, they quote *faithfully*. They might well be forgiven for not supposing that the promulgator of the wretched apparatus of 1707 had invented the atmospheric engine in 1695; and it might have been expected that a paper making such grave charges should

not have exhibited so many and such singular discrepancies between the representation and the truth, as have been here pointed out.

A. Ainger.

On the Filtration of Water on a Large Scale.

At a meeting of the Royal Institution, Brande gave an account of the present state of the supply of water to the British metropolis; a subject which has recently excited very particular attention, in consequence of a large portion of it being derived from the Thames, into which is discharged the larger portion of the fluid filth of that immense city. Of this fact some notice is taken in the article on Filtering, at p. 221. In the course of his remarks, Mr. Brande described the process of filtration as applicable to very large quantities of water, and gave an account of the works lately carried into effect for this purpose by the Chelsea Company, and showed a model of their arrangements for the purpose, for which, as well as for the following particulars, he was indebted to Mr. Simpson, the engineer to that company:—

"The pond which contains the filter-bed is forty-four feet square at top, and made with sloped banks, the bottom being twenty-six feet square; it is six feet deep; the mode of forming the bed was as follows:—after the pond was made water-tight, with a drain through the bank to the well, the bottom was covered with coarse gravel, in which drains were built without any cement between the joints of the bricks; they were covered with coarse gravel, and then with finer gravel, with coarse sand and finer sand, until the strata of gravel and sand were each two feet thick, both gravel and sand having been selected with care, and well washed. The reservoirs were each thirty-two feet square at top, twenty feet at bottom, and four feet deep; the low water line of them being level with the high water line of the filter-bed; the reservoirs were worked alternately on to the filter-bed, and it was regulated to filtre 12,000 cubic feet of water every twenty-four hours; and the water was remarkably pure and limpid after it had passed the bed. The silt which was stopped on the bed was regularly cleaned off with a small portion of the sand every fourteen days; the principle of the action depends upon the strata of filtering material being finest at the top, the interstices being more minute in the fine sand than the strata below, and the silt, as its progress is arrested, (while the water passes from it) renders the interstices between the particles of sand still more minute, and the bed generally produces better water when it is pretty well covered with silt than at any other time. The silt has never been found to penetrate into the sand more than three inches, the greatest portion always being stopped within the top half inch of the sand, and in cleaning the silt off, it has never been found necessary to scrape any more of the sand off with the silt than the first half inch depth, and sometimes only half that depth was removed. The small air pipes from the

drains are to prevent injury to them, or the filtering materials, by condensation or otherwise.

"The large filter-bed at Chelsea is a surface of nearly one acre, and is constructed precisely on the same principle as the experimental bed, the details of forming and working it being greatly improved and adapted to the enlarged scale. The perfecting this bed has been a work which required the greatest attention and perseverance; it was set to work, and supplied the Chelsea Company's district, for the first time, on the 14th of January, 1829, and is of sufficient capacity to filter 500,000 cubic feet of water ever twenty-four hours: it is working with the greatest success during this inclement season, and although the water on the bed is this day covered with ice five inches thick, it does not impede the filtering process.

"This filter-bed was made after the engineer had seen several similar works upon a small scale in England and Scotland, which have been at work some years, and he has combined in it the several advantages he observed in the filter-beds he examined.

"It is proposed to follow up the improvement by extending the suction pipe up the river, and pumping the water (during the last two hours of ebb tide only) into small reservoirs constructed close to the filter-bed, and the water will be filtered as it is required for the supply of the town, and the main pipes will be so constructed that none but filtered water can be pumped into them."

It will be seen by Mr. Simpson's evidence before the commissioners appointed by his majesty to inquire into the state of the supply of water to the metropolis, that the water, by filtration, could be rendered perfectly clear, excepting during extraordinary land floods, when upon a close inspection he had perceived a slight loamy colour in the water after it was filtered, which was scarcely discernible in a glass tumbler. Mr. Simpson now remarks that the water in the large filter-bed is much better than it ever was in the experimental bed.

On a mode of Rapidly Sketching effects in Chiaro-scuro, and its application to Lithography.

At a meeting of the Royal Institution, held on the 13th of March last, Mr. Brockedon offered some remarks upon a mode of rapidly sketching effects in chiaro-scuro, and its application to lithography; he stated that the process was similar to that of engraving in mezzotinto, which he thus described. Upon a smooth surface of a plate of steel, or copper, the artist lays what is termed a ground by means of a cradle, a steel instrument, having a serrated edge, which, by a rocking motion, is made to pass all over the plate, and in every direction: this raises a burr, upon which, if printer's ink be laid, it will deliver a uniformly black impression. Upon this rough or raised surface the design is made; and the intended forms are produced by scraping off the burr to the depth of tint required, or if necessary scraping it smooth, that in such parts as no burr remains upon to

hold the ink, the surface of the metal would wipe clean, and such parts would appear white in the impression. In a similar way the new process consists in blacking the surface of paper with any mixture of black and a greasy substance, and then with a knife, or scraper, removing it from such parts as are intended in the design to be white or light. Mr. Jackson, the Royal Academician, appears to have been the inventor of this process. Some clever specimens of landscape sketched in this way by Mr. Harding, were shown by Mr. Brockedon, as well as some drawings of his own, of draped figures. One of these was produced in the short space of twenty minutes, and the other in half an hour. The material which he employed was ivory black, prepared in the usual way as for painting in oil; this was rubbed over a white Bristol board with a brush, and the drawing immediately proceeded with. Sketches and studies made in this manner in oil colour, when finished and dry, if worth preserving, may be safely kept, and are not liable to injury from rubbing.

In the application of this process to lithography, lithographic ink is laid over the surface of the stone in a fluid state, and when dry, it is scraped off where required with a mezzotinto scraper, and the designs executed with great facility. Any degree of tint may be produced; parts may be repaired or altered, minute white or black lines, or dots, which it would be difficult to produce on metal, may, in lithography, be made by scratching out with the point of a knife or needle, or drawing dark lines with a camel's hair pencil and lithographic ink, where such lines are required upon places where the ground has been removed. In this way sketches of great boldness, or drawings of extreme delicacy, may be produced. The process of printing from drawings thus executed is certain in its operation, which is not always the case in lithography, when the design is drawn on the stone; as a delicate tint can only be obtained by a fine point on the lithographic chalk and light execution, which, when finished, is liable to be injured by the operation of printing. On the contrary, by this process, the ink being laid on fluid, firmly and perfectly adheres to the stone; it is known that above 100,000 impressions have been taken from lithographic writing which has been laid on with fluid ink. Beautiful and various grain may be obtained on the surface of the stone equal to the tints from metal. The stone employed in lithography is capable of receiving the smoothest surface; but the grain which appears in the print depends upon the degree of the fineness of the sand which is used in finishing the surface of the stone, which may be made to produce a variety and fineness in the grain of the tints similar to those which are so delicate and beautiful in Mr. Martin's celebrated plates in mezzotinto upon steel. Mr. Brockedon acknowledged the assistance which he had received in his experiments from Mr. Hulmandel and Mr. Harding, and exhibited a head the size of nature, which was printed from a drawing made on stone, with which Mr. Hulmandel had obliged him. He also showed a lithographic print by Mr. Westall, and some spirited

lithographic prints by Charlet, a French artist, which displayed many varieties of this new or improved process.

Manufacture of Glass for Optical Purposes.

At a meeting of the Royal Institution on the 12th of June, Mr. Faraday gave some account of his experiments on the manufacture of glass for optical purposes.

It is pretty generally known that a committee and a sub-committee of the Fellows of the Royal Society have been formed to experiment upon the production of glass fit for optical purposes, *i. e.* free from blebs, spots, streaks, and above all, waves and striæ, so that it may have a uniform action upon light. The sub-committee consisted of Messrs. Herschel, Dollond, and Faraday, who each took those respective parts of the investigation which accorded with their particular pursuits. The Royal Society some time since applied to the Royal Institution for leave to erect upon the premises of the latter a furnace and furnace-house for the performance of numerous experiments of investigation, which was immediately granted, and which has now been in operation twenty-one months. Mr. Faraday stated that although he ought to make the first official report of his progress to the president and council of the Royal Society, yet he had been permitted, in consideration of the present evening being the last of the meetings of the Royal Institution, to anticipate, and lay before the members of the latter, in a verbal report, an account of his proceedings.

A brief account was then given of the great discovery made by John Dollond, in 1758, of the construction of achromatic object glasses; of the consequent demand for good glass; of the attempts of Guinand, Frauenhofer, Bontemps, Lerebours, &c.; and of the difficulties, great as ever in this country, if not also in France, of getting good glass.

Mr. Faraday then minutely described the nature of the peculiar optical glass, which, for the last nine months, has had his undivided attention, and also the process of working it, which was illustrated by all the apparatus. Ordinary flint glass may be considered as a compound of oxide of lead, silica, and alkali. Faraday's heavy glass is a compound of oxide of lead, silica, and boracic acid: alkali is found to be very injurious in it. It is readily fusible at a red heat, and after the materials, perfectly pure, are mixed and fritted into a rough glass in earthenware crucibles, the required portion is transferred into a platina vessel, and completed by stirring and other operations until it is perfectly uniform and clear, and fit to be cooled and annealed.

Mr. Faraday stated that he had been racing against time, and had not lost the match, for that a piece of glass, which he hoped would prove nearly unexceptionable, had been taken out of the furnace, and was in the hands of Mr. Dollond to be manufactured into a telescope. It had, indeed, been formed into an instrument, and by such

inspection as time had allowed, was good, but it wanted a still more rigid examination. Three telescopes of this glass had been made; every instrument was an improvement upon the former, and the experiments generally had advanced towards perfection from first to last. Although very anxious not to excite hopes which would not be justified in the fullest manner, still the doubts Mr. Faraday entertained of perfect ultimate success seemed very slight.

On the Flowing of Sand under Pressure.

A YEAR or two since, M. Huber Burnand described an anemometer to the Philosophical Society of Geneva, in which the force and duration of the wind were ascertained by the quantity of sand which escaped from an aperture varying in its size with the wind. In consequence of conversation relative to the manner in which sand would flow, and how far it would accord with liquids in this respect, M. Huber undertook a set of experiments which have given some very curious and interesting results: these we shall endeavour very briefly to abstract.

To obtain a regular fall of sand, it must be well sifted, but must not be too fine. That which will just pass through a sieve containing 38 wires per inch in one direction, and 45.6 in the other, flows with great facility; but the aperture must never be less than .079 of an inch in diameter. The sand, in the experiments, was generally contained in wooden boxes, closed at the bottom by four moveable plates, so that the aperture could be widened or lengthened at pleasure, the edges of these plates being bevelled on the exterior. The sand which had passed the aperture was estimated both by weight and measure.

The quantity of sand which flows in a given time through a given aperture is the same, whatever be the volume, the weight, or the height, of the sand in the box above. The height was sometimes increased tenfold without change.

When the aperture was from .078 to .118 of an inch in width, the quantity of sand which passed was always directly as the length of the aperture; but the least increase in the width occasioned an increased quantity greater than in the direct ratio of the areas of the apertures. The first part of this result may be useful in the construction of numerous instruments.

Sand passing out by lateral apertures made in the *surface* of the boxes flowed with equal velocity, whatever the height of the column within; but if these lateral apertures were made in the form of horizontal holes, and the diameters were not nearly equal to the length, not a grain of sand would pass.

Sand being poured into one leg of an inverted syphon, did not mount in the other. It extended but a very little way into the horizontal part.

Whatever pressure be given to the upper surface of the sand, it

exerts no influence on the issue below. From a quarter to half a hundred weight produced no difference.

A rod placed upright in the sand, directly over the aperture, descended without any inclination, in a very regular and uniform manner. When placed between the centre of movement and the border of the box, it also moved regularly, but gradually became inclined.

M. Huber remarks that there is, perhaps, no other natural force on the earth which produces by itself a perfectly uniform movement, and which is not altered either by gravitation or friction, or the resistance of the air: for the height has no influence; friction, in place of being an obstacle, is the regulating cause; and the resistance of the air, within the column, must be so feeble as to be altogether insensible as a disturbing force.

Single grains of sand placed upon a flat surface did not roll until the inclination of the surface was at least 30°, sometimes almost 40°. The angle formed by a heap of flowing sand is almost always between 30° and 33°; very rarely as much as 35°. Small shot and peas produced the same general effect as those described with sand.

An egg was put at the bottom of a box, and covered a few inches deep in sand: a weight of 60 lb. or more, placed over it, did not injure or affect the egg. The same result took place when the sand at the bottom of the box was put in motion by opening the aperture. Hence it is evident that the sides of the vessel support the pressure almost entirely; and also that the egg is protected from the irregular action of the pressure by the sand, to the same degree, though not in the same manner, as if in a liquid.

Other experiments fully proved that the pressure of the sand was principally sustained by the sides of the vessel. An inverted syphon had a little mercury poured in until both limbs were partly filled, and then sand was poured in on the one side upon the mercury: no elevation of the mercury in the other leg took place. Pressure was added to the weight of sand, still the mercury remained unmoved. More delicate experiments, by means of balances, showed the same effect.

A simple paper tube was rolled up; a plug fitting very loosely into the end, but not so that sand could pass it, was floated by a cork or otherwise, on water, with such buoyancy as to be able to sustain the little cone of sand that its circular surface could receive, and then the tube was held in the hand over it. On pouring sand in, the tube might be filled without displacing the floating plug below, although there was weight enough to sink plug and tube, and every thing else, if the hand had been taken away. The sides of the tube, in fact, supported the sand.

From these, and other experiments, it was concluded that it would be exceedingly difficult to *push* sand out of a tube; and upon trial, this was found impossible: the sides of the tube gave way first. Even when inclined 20° downwards, it could not be done. It is easy, therefore, to see how, in the blasting of rocks, sand is as effectual for closing the hole as a plug, the most compact driving, or any thing else.

A very simple mode of showing the most striking of these effects, is, to prepare an open tin tube, an inch in diameter, and of any length; to press a piece of thin paper against the end of it with the hand; to moisten the edges of the paper; and, replacing it, to let it adhere simply by such moisture; then placing the tube upright, with that end upon the table, to fill it with sand, and afterwards gradually to raise it. Whatever the weight of the tube and its contents, it may be carried any where in that position, although the paper bottom adheres but very slightly. [*Bib. Univ.* xl. 22.

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*On the nature, causes, and prevention of the Dry Rot.**

The vast losses that national property has sustained from the destructive effects of the dry rot on our shipping, sufficiently prove the importance of all endeavours for its prevention and investigation.

The dry rot in ships seems comparatively to be of no very remote origin, as it is only about sixty years since, that much notice was taken of it in publications on naval subjects, and its ravages appear to have increased more as we approach nearer to the present time, if we may judge from the more frequent and more earnest attention, that it has experienced within that period. This consideration gives very great importance to the opinion of those who maintain that the great prevalence of this mischief in latter times, has been caused for the most part, if not entirely, by the introduction into the national forests of a species of oak by no means indigenous to the country; and, as this may be traced to the time of the reign of William III. and the commencement of that of Queen Anne, if dry rot proceeded from the use of this timber, it would naturally appear when the plants, then put into the earth, would have attained the size proper for ship building; which will be found to correspond very nearly to the period to which we have alluded, when this evil first seems to have much attracted public observation. We have many instances of ships built before this species of timber came into use, which lasted six or seven times longer than the average period of their present duration; of these, to prevent the annoyance of long catalogues, it may be sufficient to mention the Royal William, which was launched in 1719, and never repaired until 1757; was surveyed afloat in 1785, and probably lasted many years more; and the

* The alarming prevalence of dry rot, especially in the timbers of ships, gives to every intelligent inquiry upon this subject, a very high degree of interest. At present we neither know the cause nor the cure of this premature decay in timber, opinions upon the subject being almost as numerous as the writers; and certain it is, that the preventives which have been proposed were formerly unnecessary, in the same kinds of timber; and we confess that we are much more favourably disposed to the opinion that the place in which the fires were formerly made on board of vessels, had a favourable influence in preserving them, than that the disease has been produced by the substitution of foreign for the indigenous oak of Great Britain. [Editor.

famous ship, Betsy Cains, the yacht in which King William performed his first voyage to England, that appears to have been then several years old, which was sold to a merchant in the reign of George I. and employed in the coal trade, in which service she existed till February, 1827, when she struck on a reef of rocks near Tynemouth bar, and was there lost only for want of timely assistance, her timbers being then perfectly sound.

The species of oak that is indigenous to the British isles, is the Quercus Robor, which produces a close grained solid timber, rarely affected by rot of any kind. The leaves of this species are short, deeply indented, and of a dark green colour; and its acorns grow singly, or at most two together, on long stalks, while its bark is somewhat rough.

The other species, from whence so much mischief has been supposed to arise, is the Quercus Sessiflora, the leaves of which are long, rather serrated at the edges than indented, of a yellow green on the upper side, and a whitish green on the under, and set on short stalks, about half an inch in length, with acorns growing in clusters, close to the twig, or very nearly so, and having its bark of a lighter colour and smoother texture than the native oak; the timber of this tree is much less solid, and more spongy. This species is also called the Durmast and the Norwood oak, and probably by several other local appellations.

This description of the different trees is given, from a conviction, that while the first should be cultivated as our national timber, almost as emblematic of Britain, as the palm was anciently of Judea, the other kind, with the many names, should be either extirpated as a noxious weed, or at least be only employed in domestic uses; while all planters should be enjoined from its propagation, if not prevented by actual penalties.

Another circumstance merits attention, as not unlikely to influence the duration of oak timber, in which there is a marked difference between what sprung up in old times, and that produced in the last century. In those remote ages the woods were wild, the oak grew where the acorn dropped, and was never without its tap root descending to great depths in the soil, and extracting nourishment from it at times when the more superficial roots were nearly inert for want of moisture; this, by itself, is sufficient to produce timber of a superior quality to that of modern times, when young oaks are transplanted with as much indifference as cabbage plants, which of course totally destroys the tap root, and more or less, on this account, deteriorates the timber.

It is also highly probable that the locality and management of the fires for cooking in ships in old times, materially contributed to secure them from the devastations of the dry rot. In the reign of Queen Elizabeth the cook room was made below in the waste or hold of the ship, and when Sir Walter Raleigh wrote his Essay on Shipping, published in 1650, the practice of making it in the forecastle had only commenced in merchant vessels, and had not been introduced into the navy. It is true that Sir Walter states many incon-

veniencies to arise from the old location, and much recommends that commenced by the merchants; but it is also no less certain that a fire being maintained constantly in the hold of the ship must have banished from it damps and stagnant air, without both of which the dry rot is never known to exist; and by the dryness and ventilation that it produced, must at the same time have materially contributed to the health of the seamen, who even at the present day too often suffer from typhus fever, produced by noxious air generated in the hold, and confined until it becomes more highly pestilential than in any other known instances, as has been well explained by Dr. Maccullogh in his Treatise on Malaria; and although, perhaps, it might not be adviseable to restore the ancient location of the cook room, as it would in all probability be in vain to attempt this change, even should the means of preventing all the inconveniencies pointed out from it by Sir Walter be presented; yet as a fire in the hold has been found to have produced such beneficial effects, it certainly would be most advantageous to again have one in that part of the ship; the fire place for which might be so managed as to occupy but little space (since no cook room need be added) more especially as the flue from it might be brought up through the pump well; and being enclosed by an iron case, and brought high above deck, like the chimneys of steam-ships, would cause no risk from fire, or any other inconvenience; while, in addition to the practice of passing water through the hold every day, by means of cocks and the pumps, (recommended by the Doctor, and employed by some naval captains with the best results), it would both prevent destructive sickness, and materially increase the duration of the ship, by removing completely the most potent sources from whence the dry rot originates.

A cause of dry rot has been assumed by a writer in the Westminster Review for April, 1829, to be a vegetable of the fungus species, that works its way in the body of the wood *without producing any external appearance;* but it is so contrary to the course of nature, that any plant could exist without organs, analogous at least to leaves, for acting on the air chemically, that we may well be excused for doubting the fact, at least till it is most unequivocally proved; and although the truffle seems to be a plant of this nature, and to countenance the opinion, yet it has so often happened, that supposed anomalies in nature have disappeared before more accurate investigation, that even in this instance the same doubt may be retained with the strictest propriety: and even if it were proved, that some such undermining hidden agent existed for the destruction of timber, independent of the known sources of putrefaction; the effect would be so much more similar to the known operation of certain minute insects, that the best proofs must be produced that these are not the cause, before assent should be given to an origin of it, subversive of a law of nature that seems to be universal. Dry rot has also been attributed often before to a fungus growing openly in the usual manner; but as common rot has either always been known to exist previously to the appearance of this fungus, or the causes of it at least to be in powerful activity on such occasions, this latter plant

must be considered as a secondary assistant and accelerator, instead of a primary cause.

Mr. George, who has lately obtained a patent for the prevention of the dry rot, has also lately promulgated a new origin for the dry rot, in attributing it to the effect of the variations of temperature transmitted through the wood; but we imagine other causes for putrefaction existed amply in the locality of his cellar (the rapid decay of the door of which led him to form this novel opinion), besides those that he has mentioned, as it is not twenty yards from the Rolls Chapel, which was and is still a public place of worship; and as such places were accompanied by cemeteries until very lately, and as some monuments still remain in the chapel, there is the highest probability that a burying-ground existed and extended beyond Mr. George's cellar, and that this is actually surrounded by the remains of the deceased of former times—the effect of which on the air of the place is alone sufficient to rot not only the door, but every other matter capable of decay placed within its influence, without seeking for any remote or fanciful causes.

Mr. Langton, who obtained a patent for seasoning or drying timber in August, 1825, has, in his remarks on it, recommended his method as a means of preventing the dry rot in ships; but, as his process extracts nothing but water from the timber, and leaves its mucilaginous parts unaltered, when it is exposed again to wet or damp, as must occur in all vessels at sea, the attraction of these substances for water, and their effect in accelerating the rot in the fibrous parts of the timber from this circumstance, must soon render ships built with dried timber as liable to this evil as they were before. (See p. 156, vol. 2, for 1826.)

Mr. Newmarch's patent of February, 1826, professes also to prevent the dry rot, by boiling the timber in oil, mixed with substances that are not very adviseable for the purpose. This method, however, has the advantage over the last in producing permanent effects, as it is certain that timber so prepared would not be liable to attract moisture as before, while most of what it held originally would be driven out effectually by this process; but if tallow were substituted for oil, and sulphur for the other ingredients, the plan would be more likely to have the effect intended, since the tallow would be retained in the capillary tubes of the timber on cooling, instead of running out again, as most of the oil would; and the sulphur would readily dissolve in this, while the salts would not in the oil, with which they are directed to be mixed by the specification of this patent. (See p. 304, vol. 2, for 1826.)

And here the opinion of the Westminster Reviewer, that all attempts to prevent dry rot, by previous preparation of the timber, are mere quackery, must be reprehended, as at least very unphilosophical and hasty, as well as his sneers against the late Sir Humphrey Davy for something of this nature, that he asserts was proposed by this eminent chemist. It is not very long since chemistry has began to be much applied beyond the limits of medicine; and no man can fairly aver that it cannot effect this purpose, as well as

many others of great utility, in which it has succeeded most completely. In fact, Mr. Newmarch's method may be considered as chemical; and had he been better acquainted with this science, he would doubtless have made it more efficacious. Experiments, however, for preventing the dry rot in ships, require to be executed on a scale that very few individuals have the means of executing; and as they must therefore be tried either by departments of government, (the minds of the chiefs of which are probably too fully engaged with other matters to attend to affairs of this nature), or else by joint companies, it is no wonder that no certain remedy for this evil has yet been indisputably ascertained.

But chance, which often gives valuable information to observers, has pointed out a preventive of the rot in timber, that while it promises to be efficacious, has at the same time cheapness to recommend its employment. It has been found that the timber used about the copperas works at Whitstable, in Kent, has continued in a sound state for very many years, which the seafaring people of that place attribute to its being soaked in the liquor that runs from the copperas stones, and are unanimous in thinking this would prove a complete preventive of dry rot; there is the greater reason to hope for a good effect from this, as the copperas liquor, by its sulphuric acid, has a decided action on every part of timber, somewhat analogous to that which charring has on its surface, by which it has been long known to be preserved, where it would otherwise have decayed rapidly.

That there should be two species of rot, as urged very dogmatically by the Westminster Reviewer, is not to be admitted without proofs of the most incontrovertible nature, more especially as the dry rot may be accounted for, as to its peculiarities, from circumstances solely accidental to the timber, and depending on the same conditions of temperature and moisture as the common rot.

That the rot in timber does not take place, if it be thoroughly dried, and kept afterwards from wet, is too well known to require proof; and, on the contrary, there are many instances of its being preserved sound for centuries when entirely immersed in water. It therefore seems necessary, to produce rottenness, that the degree of moisture in it should not be such as will prevent the entrance of air into its pores or minute tubes, while any portion of it under this quantity accelerates the process, and some is absolutely necessary; the water seems on this occasion to be decomposed, and its oxygen to combine with part of the carbon of the wood to form carbonic acid, while its hydrogen becomes united to another portion to produce carbonated hydrogen; and as mucilaginous substances have great attraction for water, that timber which contains most of them, or which, in other words, retains most sap, will be most liable to rot, while at the same time the parts of the same timber, that are kept dry, will still remain sound. Now as dry rot takes place in the internal parts of timber, while the outside exhibits often no appearance of decay, it is only necessary for this effect that the outside of it should be kept dry, while the inside retains that portion of

moisture that produces rottenness; and in this state, in every species of building, all timber must be, that still retains sap, or has not been deprived of its natural moisture, and is not too solid to admit moisture again; or, what comes to the same result, is sufficiently spongy and open to admit moisture, and is possessed of mucilage for its retention. Putridity then commencing in the internal part of such timber (while the outside remains sound from the dryness caused by its exposure to the air,) the minute seeds of fungus, which seem to penetrate every where, begin to send out roots, as all seeds will beneath a soil fit for them, but do not complete the plants until the stalks reach the surface. The roots so produced may, and probably do, on decaying, increase the tendency to rottenness in the timber; but that the whole plant of each fungus grows entirely in the centre of timber perfectly sound, as asserted by the Reviewer, and causes it then to rot, is, as before noticed, so contrary to all those processes of nature, that are exposed to view, as to be totally incredible.

The preceding methods of preventing the dry rot in ships, independent of the species of timber used, may be classed into those that are applicable after the vessel is constructed, and those to be employed for the previous preparation of the timber; of the latter, Mr. Newmarch's process, and that by copperas liquor, which may be called the Whitstable discovery, are the best; but this last is much the cheapest; and it is only necessary to add respecting it, that if the timber be artificially dried, before it be immersed in the liquor, either by exposing it in stoves, or in an apparatus similar to Mr. Langton's, it will imbibe the solution much more completely and rapidly. The choice of the timber of which a ship is to be built, is however, as before explained, of the greatest importance with this view; and none of the Quercus Sessiflora should ever be employed in any part of its frame.

The first class of preventive means, comprised in the daily washing out of the hold, and in keeping a fire constantly in it in a fireplace properly formed and arranged, would be very beneficial, both for the prevention of rot, and the preservation of the health of the seamen, as has been observed; but as the action of the latter method particularly, and of the former in a great measure, would be much promoted by the entire absence of inside planks or ceiling, as it is technically called, it may be proper to state here, that a perfectly safe method of building ships without inside planks, is described in the last mode of constructing them, recounted in that specification of Mr. J. W. Boswell's patent for building ships, from which Sir Robert Seppings has borrowed so very largely on several occasions, without any acknowledgment. B.*

[*Repertory of Patent Inventions.*

* Does not the last remark render it probable that the signature B. is the initial of Boswell?

On the Manufacture of French Articles of Perfumery.

[Concluded from page 302.]

LIQUID ALMOND PASTES.

These pastes are esteemed, on account of the advantage they possess, of being used without water. Such are those of the rose, orange, vanille, and *bouquet*.

The honey paste, is, however, justly preferred; and is prepared in the following manner:—

6 pounds of honey.
6 pounds of paste of bitter almonds.
12 pounds of the oil of ditto.
26 yolks of eggs.

The honey must be boiled separately, and strained; we then add the six pounds of almond paste, and knead them together; and finish the operation, by adding gradually and alternately, the quantities of yolks of eggs, and oil of bitter almonds, indicated.

ROUGE.

We put into linen bags *carthamus* or *safflower*, and place them under a stream of running water, taking care to beat them strongly all the while; by this means we are enabled to separate the red from the yellow colouring matter of the carthamus; we continue this treatment until the water ceases to be any longer coloured. The tint of the material will then have completely changed its appearance, and have become of a fine red; we then treat it in the cold, with a solution of potash, at four degrees, for twelve hours, and decant it. We then take the nearly exhausted residuum, and treat it anew in the same manner, but by a solution of potash marking only two degrees. All the liquids being then united, we pour in by degrees, the juice of citrons, to a perfect saturation: the red colouring matter will then gradually precipitate; containing, however, some portion of the yellow; we completely free it from this, by plunging it into a piece of cotton cloth, which completely separates the two colouring matters; but on treating it anew with potash, the red colouring matter alone will dissolve, and the yellow remain adhering to the cloth. It is then sufficient to again saturate the alkaline liquor with citron juice, and the red colour of the carthamus precipitates; this is afterwards mixed with prepared talc, and sold under the name of *fard rouge*.

WHITE.

The pearl white is procured by dissolving bismuth, previously freed from arsenic, in nitric acid, diluted with one-third its weight of water; it is better that the nitric acid should be perfectly pure, and the solution limpid. Often, however, this appearance will not present itself, as there is generally formed an arseniate of bismuth but little soluble; in this case we must decant it, and pour into the solution a great quantity of water, and until the precipitate forms more abundantly. This precipitate must be frequently washed to free it from an excess of nitric acid; this done, and if it has been well pre-

pared, it will be of a brilliant whiteness, and in small micaceous scales.

ROSE, ORANGE-FLOWER, AND VANILLE PASTILS.

Rose Pastils.

12 ounces of gum arabic.
12 ounces of olibanum, in tears.
12 ounces of storax, ditto.
8 ounces of nitre.
16 ounces of powder of white roses.
3 pounds fourteen ounces of charcoal powder.
1 ounce of essence of roses.

Orange-flower Pastils.

12 ounces of gum galbanum.
12 ounces of olibanum, in tears.
12 ounces of storax, in tears.
8 ounces of nitre.
3 pounds fourteen ounces of charcoal powder.
1 ounce of superfine neroli.

Vanille Pastils.

12 ounces of gum galbanum.
12 ounces of olibanum, in tears.
12 ounces of storax, ditto.
8 ounces of nitre
8 ounces of cloves.
16 ounces of powder of pure vanille.
3 pounds fourteen ounces of charcoal powder.
4 *gros* of essence of cloves.
8 ounces of essence of vanille, first infusion.

We must thicken each of these mixtures with two ounces of gum tragacanth, dissolved in two pints of rose water. It is necessary to add, that all the materials must be reduced into the state of an impalpable powder.

The making of pastils naturally leads us to describe *le parfum des rois*. Some drops of this liquor being burnt in an apartment diffuses a most agreeable odour; it may be made either by infusion or distillation:

8 *litres* of spirit, at three-sixths.
1 pound of gum benzoin.
1 pound of storax.
8 ounces of aloes wood.
1 *litre* of spirit of roses, first infusion.
1 *litre* of spirit of orange-flowers, first infusion.
8 ounces of essence of amber, ditto.
8 ounces of essence of musk, ditto.
1 pound of essence of vanille, ditto.

Our ladies also use the *odoriferous cassolettes*, which they constantly

carry about them to balls and public spectacles. The paste which forms them is thus prepared:

8 pounds of black amber.
4 pounds of rose powder.
2 ounces of gum benzoin.
1 ounce of essence of roses.
1 ounce of gum tragacanth.
Some drops of oil of sandal wood.

We must first pulverize all these substances, add the liquids, and form them into a paste with the gum tragacanth.

ESSENCES.

We shall now enumerate the essences most generally employed in perfumery.

Essence of roses.	Essence of *bizarrade*.
Essence of neroli.	Essence of citron.
Essence of cloves.	Essence of Portugal.
Essence of *petit-grain*.	Essence of amber.
Essence of bergamot.	Essence of musk.
Essence of zest of citrons.	Essence of vanille.
Essence of distilled citrons.	Essence of lavender.
Essence of thyme.	Essence of cinnamon.
Essence of rosemary.	Essence of *limette*.
Essence of myrrh.	Essence of English mint.

Unfortunately, we seldom find these essences in commerce unadulterated. We may mention, for instance, those of *bergamot* and citron, in which we constantly find a greater or lesser quantity of the essence of Portugal; sometimes we find them still more grossly falsified, by adding variable quantities of oil or spirit. We have no certain means of detecting the falsification; nor have the experiments made with this view hitherto been sufficiently satisfactory.

ESSENCES MADE BY INFUSION.

Essence of Musk.

5 ounces of musk cut into small morsels.
1 ounce of civet.
4 *litres* of spirit of *ambrette*.

We put the whole into a matras, and expose it to the heat of the sun for the space of two months, choosing the hottest months in preference. But if the preparation be made in winter, we must employ a water bath.

Essence of Vanille.

3 pounds of vanille, in branches, of the first quality; these must be cut into small morsels;
4 *litres* of spirit of *ambrette*.
2 *gros* of cloves.
4 *gros* of cinnamon.
Half a *gros* of musk.

Pursue the same method as for the essence of musk.

Essence of Amber.

4 ounces of amber-gris.
2 ounces of musk.
4 pints of spirit of *ambrette*.

To be treated also in like manner.

Essence of Rhodes.

This essence has been used for these twelve or fifteen years past, but much more commonly lately; it is, indeed, imperfectly replaced by the essence of roses of Constantinople and France; the latter being now worth 100 francs the ounce; whereas, formerly, we could hardly obtain forty-five francs for that of the first quality. Many perfumers also employ it to mix with the essence of roses, as it communicates to the latter a strength which it does not ordinarily possess. It is, particularly, the scientific perfumers, who perceive this advantage.

Esprit d'Ambrette.

They take twenty-five pounds of *ambrette*, which they distil with twenty-five *litres* of spirit of three-sixths; to which they also add six pints of water, and draw off twenty-five *litres*. The spirit of *ambrette* employed in the preparation of the essence of vanille is thus made.

Perfumed Bags.

These are formed of cotton cloth, filled with odoriferous powders, and afterwards covered with taffety, the colour of which varies according to the taste of the wearer.

At Montpelier the powders are replaced by the odoriferous plants; such as thyme, wild-thyme, and rosemary.

Powder of Carnations.

3 pounds of Provence rose leaves.
3 pounds of iris leaves.
6 ounces of cloves.
1 pound four ounces of *bergamot* rind.
1 pound eight ounces of grains of *ambrette*.
6 ounces of cinnamon.
6 ounces of long cyprus.
1 pound ten ounces of pale rose leaves.
8 ounces of dry *rassies*.
8 ounces of orange-flowers.
8 ounces of the leaves of carnations.

We must mix the whole together, and powder and sift it as fine as possible.

Powder of Musk Roses.

6 pounds of pale rose leaves.
1 pound of cyprus powder.
1 *gros* of essence of roses.

Follow the same process as for the preceding powder; but observe, that the essence of roses is not to be added, until the powder has been made and sifted.

POMMADE GLOVES.

Every one knows that these gloves are used for softening and refreshing the skin. They are prepared with a *pommade à fleurs*, to which is added a little white wax. As the odour of the rose is the sweetest, this is generally employed in preference.

VINEGARS FOR THE TOILETTE.

These are always made by distillation, and of whatever odour may be required to be communicated to them.

Rose Vinegar.

60 pints of natural vinegar, of the first quality.
4 pounds of dried pale rose leaves.
Distil the whole and draw off thirty pints.

Thyme Vinegar.

60 pints of natural vinegar.
4 pounds of thyme flowers.
Distil, and also draw off thirty pints.

To give a more agreeable perfume to this vinegar, thirty pints of rose vinegar may be added to it.

We may also follow the same process to form the following vinegars, viz.

Rosemary,	Cloves,
Marjorum,	Laurel,
Wormwood,	Wild thyme,
Angelica,	Lavender,
Savory,	Citron,
Balm,	Orange-flower,
Cinnamon,	*Des sultanes.*

We can also prepare vinegars for the toilette of other odours; such as those of vanille, carnation, jasmine, tube rose, and others. These last, for example, are prepared by distillation, by adding extracts of strong odours.

Amongst the various kinds of vinegars employed to expel bad air, we shall indicate that which has been long known, under the name of *vinegar of the four thieves.*

200 pints of vinegar of the best quality.
One and a half pounds of dried rosemary.
One and a half pounds of dried sage.
One and a half pounds of dried mint.
One and a half pounds of dried rue.
One and a half pounds of lavender flowers.
One and a half pounds of *calamus.*

One and a half pounds of cinnamon.
One and a half pounds of garlic.
12 pounds of the greater wormwood.
12 pounds of the lesser ditto.

We distil off these 200 pints of vinegar, from the materials, not bruised; and then pour it upon another equal quantity of the materials, completely pulverized. After suffering them to infuse the necessary time for the impregnating of the vinegar, we distil off twenty-five pints, in which we dissolve, in the cold, one pound of camphor, and then add to the solution twenty-five cloves. This last material is intended to communicate the desired colour to it. The whole is then suffered to remain at rest till the process is finished. The residuum of this operation will serve to prepare a new quantity of vinegar, equal to the first.

There are also many vinegars possessed of other properties—such as vinegar for the stings of gnats; Seville vinegar, for moistening tobacco; vinegar of squills, for the voice; dentifrice vinegar, and Roman vinegar, for the teeth; vinegar of Flora, to abate the heat of the skin; *vinaigre spectique*, for freckles; and lastly, dissolvent vinegar, for corns on the feet.

VINEGAR DE ROUGE.

Many persons prefer this to the *rouge* in pots, or in powder, on account of the facility in using it, which it affords.

Composition of Vinaigre de Rouge.

8 ounces of carmine, of the best quality.
4 ounces of cochineal, in powder.

These ingredients are to be boiled in twelve pints of rose water, and eight pints of spirit of roses; and their colour developed with two ounces of cream of tartar, and one ounce of alum. The liquid of this first operation constitutes the first shade; the second shade is obtained with the residuum, by again adding the same quantities of rose water and spirit of roses to it.

The residuum of the second shade again serves to make a third, by adding similar quantities of rose water and spirit of roses to it.

We regret that it is not in our power to afford longer details of an art, which, in many respects, possesses an interest sufficiently important; nevertheless, what we have given, will be sufficient to enable any one to conceive the progress of every particular of this manufacture. And we may remark, that the art is yet but in its infancy. In fact, it is every day profiting, from the discoveries which the physical sciences add to the processes of manufactures.

EDWARD LANGIER.

Experiments on the Friction and Abrasion of the Surfaces of Solids.

By GEORGE RENNIE, ESQ. F. R. S.

From the Transactions of the Royal Society.

Continued from page 295.

THE apparatus employed in performing the experiments on the friction of attrition consists simply of a strong table accurately made and adjusted, and provided with a platform capable of being elevated to any angle within thirty degrees, as shown by the graduated arc.* The substances tried were placed on the platform and in the sliding block above, to which the scale and weights for bringing the substances into closer contact were suspended: a cord going over a pulley was attached to the sliding block, which received its motion from weights put into the moving scale. The different phænomena were then accurately recorded, as appears by the accompanying Tables, and the conclusions derived from them.

TABLE I.—*Experiments on the Friction of* 3 *square inches surface with cloth.*

Weight on surface.	Weight required to move it.	Proportion.
Black Single Kerseymere. No. 1.		
lbs.	lbs. oz.	
1	1 6	
2	2 4	
5	4 2	1 21
10	6 4	1 60
20	9 13	2 03
28	13 2	2 13
56	20 11	2 70
Superfine Blue. No. 2.		
lbs.	lbs. oz.	
1	1 3	
2	2 12	
5	5 3	
10	8 4	1 21
20	12 11	1 57
28	15 5	1 82
56	22 11	2 47

* An engraving of this apparatus will be hereafter given.

Experiments on the Friction of 3 *square inches surface with Cloth.*

Weight on surface.	Weight required to move it.		Proportion.	
Drab Milled Kerseymere. No. 3.				
lbs.	lbs.	oz.		
1	1	11		
2	2	11		
5	5	8		
10	took 2½ lbs. in addition to start it	7	13	1 28
10	after remaining 12 hours it took to start it	12	10	
20	12	11	1	57
28	16	7	1	70
56	25	3	2	22
Drab Kersey Hunter. No. 4.				
lbs.	lbs.	oz.		
1	1	5		
2	1	15	1	03
5	3	8	1	43
10	5	4	1	90
20	8	11	2	30
28	10	0	2	80
56	19	3	2	92
Strong Drab. No. 5.				
lbs.	lbs.	oz.		
1	0	15	1	06
2	1	8	1	33
5	3	2	1	60
10	4	11	2	13
20	7	11	2	60
28	9	12	2	87
56	17	14	3	13

Remarks.

1. That with fibrous substances, such as cloth, friction diminishes with an increase of weight.
2. That friction is greater (cæteris paribus) with fine cloths than with coarse cloths.
3. That friction is greatly increased by time.
4. That friction varies from one-third to an amount greater than the total weight.

TABLE II.—*Experiments on the Velocities with Drab Milled Kerseymere, No. 3.*

Wt. on surface	Weight required to move it	Total space passed over.	Time in seconds.	Remarks.
Of 9 square inches surface.				
lbs.	lbs. oz.	inches.		
1	1 8	24	45	From 1 lb. to 2 lbs. the adhesion is greater than the weight on surface.
			32	
			30	
			22	
			23	Velocities very irregular.
1	1 5		24	
			25	
			40	
			37	Velocities very irregular.
2	2 5		31	
		sec. half way in 17 the whole in	26	
			17 27	
2	2 5		21 30*	* Denote the experiments that approximate the nearest to a uniform velocity.
			33 53	
			17 30*	
5	4 3		29 45	Results very irregular, owing perhaps to the fibres of the cloth having been previously compressed.
10	6 7	mean of 3 trials	45 63	
20	9 7		30 50	
Of 18 square inches surface.				
lbs.	lbs. oz.	inches.	1st half. 2nd half.	
20	13 6	mean of 3 trials 21	23 33	Increase of surface shows an increase of resistance with equal wts. of 20 lbs.
20	after remaining 14 hours it took to start it 23 3			Time nearly doubles the resistance.
Of 27 square inches surface.				
lbs.	lbs. oz.	inches.	1st half. 2nd half.	
1	2 8	mean of 3 trials 18	4 14	Three times the surface nearly three times the resistance.—Velocities irregular. Vide Vince's Experiments.
2	3 10		30 73	
5	6 7		25 60	
10	10 2		28 55	Nearly uniform.

1. From the foregoing experiments it appears that velocities observe no particular law, except in three instances, where the last halves of the space passed over approximate to the first halves.

2. That increase of surface very much increases the resistance.

TABLE III.—*On the Friction with Cloth at different angles of elevation.*

Weight on surface.	Moved at degrees.	Space passed over.	Time in seconds.	Proportion.
Of 3 square inches.				
lbs.	°	inches.		
10	37.00	24	55	1.327
20	28.20		55	1.855
28	26.00		47	2.051
56	20.45		44	2.640
Of 27 square inches.				
lbs. oz.	°	inches.		
13 8	45.00	18	32	1.000
20 0	40.30		42	1.171
28 0	35.45		32	1.389
56 0	26.00		28	2.052

1. In comparing the results given by the angles of repose with the results given by the horizontal surfaces on similar kinds of cloth, there is a slight variation.

2. The second series of experiments afford no measure of comparison, from the inadequacy of the weights of 10 lbs. being unable to give motion to the upper surface, 13 lbs. 8 oz. gives an approximation.

3. The less the weight, the greater the angle of repose.

4. Increase of surface produces a very great increase in the angles of repose.

The times very variable, diminish with increase of weight.

. Velocities likewise variable.

TABLE IV.—*On the Friction of different Woods two square inches surface.*

Weight on surface.	Weight required to move it.		Proportion.	Weight per square inch.		Average.
Red Teak on Red Teak.						
cwt.	lbs.	oz.		cwt.	qrs.	
½	6	14	8.14	0	1	
1	14	2	7.92	0	2	
2	23	3	9.66	1	0	
3	38	1	8.82	1	2	
4	52	3	8.58	2	0	
5	64	2	8.73	2	2	
6	71	12	9.36	3	0	8.82
7	84	3	9.31	3	2	
8	90	8	9.90	4	0	
9	120	11	8.35	4	2	
10	126	5	8.86	5	0	
11	141	15	8.67	5	2	
12	154	3	8.71	6	0	
13	170	10	8.53	6	2	

Experiments on the Friction of different Woods two square inches surface.

Weight on surface.	Weight required to move it.	Proportion.	Weight per square inch.	Average.
American Live Oak on American Live Oak.				
cwt.	lbs. oz.		cwt. qrs.	
½	7 15	7.05	0 1	
1	14 13	7.56	0 2	
2	25 15	8.63	1 0	
3	36 11	9.15	1 2	
4	55 11	8.04	2 0	
5	70 3	7.97	2 2	
6	86 3	7.79	3 0	7.65
7	109 7	7.16	3 2	
8	128 4	6.98	4 0	
9	140 3	7.19	4 2	
10	154 1	7.26	5 0	
11	162 14	7.56	5 2	
12	187 5	7.17	6 0	
Pine on Pine.				
cwt.	lbs. oz.		cwt. qrs.	
½	16 3	3.33	0 1	
1	27 14	4.01	0 2	3.40
2	68 4	3.27	1 0	
3	111 5	3.01	1 2	
Black Beech on Black Beech.				
cwt.	lbs. oz.		cwt. qrs.	
½	8 6	6.68	0 1	
1	15 5	7.31	0 2	
2	28 0	8.00	1 0	
3	45 3	7.43	1 2	
4	69 7	6.45	2 0	
5	83 3	6.73	2 2	7.13
6	100 4	6.70	3 0	
7	115 11	6.77	3 2	
8	124 10	7.18	4 0	
9	132 3	7.62	4 2	
10	148 11	7.53	5 0	
Norway Oak on Norway Oak.				
cwt.	lbs. oz.		cwt. qrs.	
½	8 3	6.83	0 1	
1	14 5	7.82	0 2	
2	26 4	8.53	1 0	
3	41 3	8.17	1 2	
4	56 7	7.93	2 0	7.67
5	67 3	8.33	2 2	
6	80 4	8.37	3 0	
7	102 0	7.68	3 2	
8	164 3	5.45	4 0	

Experiments on the Friction of different Woods two square inches surface.

Weight on surface.	Weight required to move it.		Proportion.	Weight per square inch.		Average.
English Oak on English Oak.						
cwt.	lbs.	oz.		cwt.	qrs.	
½	7	0	8.00	0	1	
1	15	0	7.46	0	2	
2	29	3	7.67	1	0	
3	43	2	7.79	1	2	7.83
4	55	0	8.14	2	0	
5	70	3	7.97	2	2	
Hornbeam on Hornbeam.						
cwt.	lbs.	oz.		cwt.	qrs.	
¼	8	10	6.49	0	1	
1	16	3	6.91	0	2	
2	30	5	7.36	1	0	
3	46	11	7.19	1	2	
4	65	5	6.85	2	0	6.57
5	83	1	6.74	2	2	
6	105	2	6.39	3	0	
7	167	3	4.68	3	2	
Elm on Elm.						
cwt.	lbs.	oz.		cwt.	qrs.	
½	10	0	5.60	0	1	
1	22	1	5.07	0	2	
2	35	5	6.34	1	0	
3	53	2	6.32	1	2	
4	72	3	6.20	2	0	5.86
5	87	11	6.38	2	2	
6	108	4	6.20	3	0	
7	145	3	5.39	3	2	
8	168	11	5.31	4	0	
Honduras Mahogany on Honduras Mahogany.						
cwt.	lbs.	oz.		cwt.	qrs.	
¼	12	7	4.50	0	1	
1	26	0	4.30	0	2	
2	39	3	5.71	1	0	
3	59	5	5.66	1	2	
4	74	7	6.01	2	0	
5	92	3	6.07	2	2	
6	107	6	6.25	3	0	5.96
7	118	2	6.63	3	2	
8	136	4	6.57	4	0	
9	154	1	6.54	4	2	
10	171	0	6.54	5	0	
11	182	3	6.76	5	2	

Experiments on the Friction of different Woods two square inches surface.

Weight on surface.	Weight required to move it.	Proportion.	Weight per square inch.	Average.
Yellow Deal on Yellow Deal.				
cwt.	lbs. oz.		cwt. qrs.	
½	19 7	2.88	0 1	
1	37 9	2.98	0 2	
2	76 3	2.94	1 0	2.88
3	113 0	2.97	1 2	
4	147 13	3.03	2 0	
5	224 0	2.50	2 2	
White Deal on White Deal.				
cwt.	lbs. oz.		cwt. qrs.	
½	18 12	2.98	0 1	
1	29 5	3.82	0 2	3.81
2	48 3	4.94	1 0	

TABLE V.—*Experiments on the Friction of two square inches surface of Wood at different angles of elevation.*

Wt. on surface.	Moved at degrees.	Time in descending 11 in.	Proportion.	Wt. on surface.	Moved at degrees.	Time in descending 11 in.	Proportion.
Red Teak on Red Teak.				**English Oak on English Oak.**			
lbs.	° ′	sec.		lbs.	° ′	sec.	
10	8 00	18	7.116	10	9 30	17	5.976
20	7 45	15	7.348	20	8 30	17	6.691
28	7 15	20	7.861	28	7 40	18	7.429
56	7 00	16	8.144	56	7 30	20	7.596
Amer. Live Oak on Red Teak.				**Elm on Elm.**			
lbs.	° ′	sec.		lbs.	° ′	sec.	
10	9 00	22	6.514	10	11 40	19	4.843
20	8 00	24	7.116	20	10 30	18	5.396
28	8 30	20	6.691	28	10 00	19	5.671
56	7 45	25	7.348	56	9 30	19	5.976
Black Beech on Black Beech.				**Hornbeam on Hornbeam.**			
lbs.	° ′	sec.		lbs.	° ′	sec.	
10	8 15	20	6.897	10	10 00	20	5.671
20	7 20	17	7.770	20	9 15	21	6.140
28	7 40	19	7.429	28	8 30	20	6.691
56	6 40	21	8.556	56	8 15	19	6.897
Norway Oak on Norway Oak.				**Honds. Mahog. on Hornbeam.**			
lbs.	° ′	sec.		lbs.	° ′	sec.	
10	8 00	19	7.116	10	12 00	22	4.705
20	7 30	20	7.596	20	12 30	21	4.511
28	7 00	20	8.144	28	11 45	21	4.808
56	6 20	25	9.010	56	11 20	23	4.990

Experiments on the Friction of two square inches surface of Wood at different angles of elevation.

Weight on surface.	Moved at degrees.	Time in descending 11 inches.	Proportion.
Yellow Deal on Yellow Deal.			
lbs.	° ′	sec.	
10	15 00	10	3.732
20	17 00	9	3.271
White Deal on White Deal.			
lbs.	° ′	sec.	
10	18 00	10	3.078
20	12 30	11	4.511
Pine on Pine.			
lbs.	° ′	sec.	
10	16 00	14	3.488
20	17 00	11	3.271

Remarks.

From the foregoing experiments it appears that there is a great deal of irregularity in the results.

Increase of pressure scarcely increasing the resistance. This may arise in some degree from the surfaces becoming condensed, and thus rendered less liable to abrasion. In some of the cases abrasion had already commenced, but it was not convenient to pursue the experiment further.

The soft woods present more resistance than the hard woods.

Yellow deal on yellow deal being the greatest,

Red teak on red teak the least.

According to Mr. Knowles of the Navy Office, F. R. S., the weight of the Prince Regent of 120 guns on the slips previous to launching, was 2400 tons; which, divided by the area of the sliding surface of her bilge-ways (equal to 149,184 square inches), gives a pressure of 36 lbs. per square inch.

But the weight of the Salisbury of 58 guns on the slips, according to the area of her bilge-ways, was 44 lbs. per square inch. Now, by the foregoing Table, the average force required to put in motion the three different kinds of oak, under a pressure of 36 lbs. per inch, is about one-eighth of the pressure, which proportion prevails even as high as 6 cwt. per inch area; and by Table IX. we find that soft soap (the ingredient mostly used for diminishing the friction of bilge-ways under a pressure of 36 lbs. per inch,) gives about $\frac{1}{16}$th of the pressure for the friction. Hence the angle at which a building slip should be laid can be easily determined. Coulomb even makes 49 lbs. per square inch, and $\frac{1}{27}$th for the pressure for hogslard.

The weight of the middle arch (of 151 feet 9 inches span) of the New London Bridge, together with the centres, is 4900 tons. This

acting upon the surface of the striking wedges equal to 540 square feet, gives a pressure of 140 lbs. per square inch. The angles of inclination of the wedges are equal to 80° 45′, and their surfaces are covered with sheets of copper well coated with tallow. On removing the check pieces, the wedges commenced gliding back slowly and uniformly, by the gravity of the arch and centres, and the motion was checked and continued until the arch was left in equilibrio.

[TO BE CONTINUED.]

On the Artificial Production of Cold. By RICHARD WALKER, Esq. *of Oxford, in England.*

To the Editor of the Philosophical Magazine and Annals.

GENTLEMEN,—It is now forty-one years since my discoveries on the "artificial production of cold" were first made public by their appearance in the Philosophical Transactions for the year 1787, and several succeeding volumes. Passing over what has already been published respecting them, I shall proceed to a detail of a few other circumstances as a kind of appendix, which I have for several seasons intended to offer for publication, had not other matters, as professional avocations and professional communications, too much engaged my attention to allow of it.

Immediately on the announcement of the discoveries as above stated, I received various proposals from respectable persons respecting their practical utility in this country. I answered these by a declaration, that wherever natural ice could be obtained and preserved, this must ever supersede the use of the artificial means alluded to. It is true that I had an eye to their application in hot climates, as between the tropics; and as soon as my experiments became public, a treatise on the diseases of tropical climates appeared from the pen of Dr. Moseley, who fixed upon one, which he considered the most appropriate, and strongly recommended its adoption as a very valuable acquisition, as well in a medicinal point of view, as a luxury.

Relinquishing, from various causes, the design of applying them myself to any such purpose, I took care, however, to point out, in my original communications, the complete efficiency of them for such intention to their utmost extent, and the best mode, as it appeared to me, of applying them in hot climates.

Understanding, a few summers ago, that a manufactory had been established for preparing ice creams, as well without the use of ice, as with it; and likewise for making for sale an apparatus for the purpose,—I was induced to visit it. I examined the apparatus,—a very appropriate one for the purpose, and likewise the freezing powder, which I instantly recognised to be the weakest in power of my various compositions for the purpose, but possessing the advantage of being readily recovered repeatedly for the same purpose with undiminished effect. This powder, by its taste and appearance, I found

to be a mixture of sal ammoniac and nitre, which I was informed was repeatedly recoverable in a fit state for refrigeration. I originally exerted every effort, in vain, to increase its power by the addition of a third ingredient, possessing likewise the advantage, merely by evaporation to dryness, of being repeatedly recovered for the same use. This powder, as related in my original communications, consists of equal parts by weight of sal ammoniac and nitre. By way of test, I recovered it by evaporation twelve times, without any abatement of its efficacy, as originally stated.

It is unnecessary to enter into a description of the apparatus just mentioned, or the principle and mode of its application, especially as the whole is embraced in the following statement.

A circumstance occurred here (at Oxford) which occasioned the method to be put to the test of useful application. A confectioner, happening in a scarce season to be unprovided with natural ice, applied to me for assistance. I assured him that in the large way (as I have stated in my original communications) the best method was to freeze water first, and then to use the ice in the usual way for freezing creams. Accordingly an apparatus of large dimensions, of rather an oblong form, was made of tin (fitter for the purpose if cased with wood) consisting of channels so constructed that the water to be frozen should be subjected to the freezing mixture on both sides.

This, properly prepared, was placed in a cool cellar, during the night; and early in the morning (the temperature in the open air in the shade in the day time being above 80°) the ice was collected, which amounted to several pounds in weight. This ice, which was as limpid as the finest flint glass, was applied in the usual way, and with the apparatus ordinarily used by confectioners for the purpose of freezing creams, and the mixed powder, of which he had procured an adequate quantity, repeatedly recovered by evaporation over his hot iron plates, for fresh use.

I shall now present the immediate object of my present communication; viz. what I consider to be the best mode and fittest apparatus for cooling wine in summer, for freezing creams in the small way for private use, and likewise for freezing a small portion of water, merely as an experiment for public or private exhibition.

The drawing annexed (Plate IV,) is designed to represent, on a small scale, the construction and exact proportions of each freezing apparatus, and likewise the construction and form of the apparatus for cooling wine.

Fig. 1, is an apparatus for freezing water on the smallest scale, as above mentioned, in the hottest weather. The vessel for containing the freezing mixture is three inches and a half in width, and its height equal in measure to its width; and the tube for containing the water to be frozen five-eighths of an inch in width, and reaching, as represented, very near to the bottom of the vessel: there is likewise a rim or continuation of the vessel, without a bottom, to insulate it from the table or stand it rests upon. The apparatus itself consists of two parts; viz. the vessel for containing the freezing mixture, and its cover, in one piece with the tube, fitting close over it (repre-

sented together in the drawing.) When the water is frozen, upon taking off the cover and wiping the tube, the solid ice will have become detached by the heat, and on inverting it drop out.

The process may be known to be completed by the going off or melting of the hoar-frost, which exhibits a curious appearance outside the apparatus.

Fig. 2, consists of an apparatus in one piece; viz. the vessel for containing the cooling mixture, and the cup or can (if I may so call it) for receiving the decanter, its top rising somewhat above the height of the vessel for an obvious reason, with a cover that will admit of easy removal (in the drawing represented together.) This apparatus likewise has an appendage or rim like the former, to insulate it from the table:—it may be convenient to be possessed of a couple of these.

Fig. 3. The apparatus for freezing creams, in which the freezing mixture is to act on both surfaces of the part containing it, as being more economical and expeditious, is not so simple. This, however, consists only of two parts; viz. the vessel for containing the freezing mixture, and a cover, to which is attached, in the same piece (instead of a tube or cup as in Fig. 1,) a concentric annular cavity or chamber, in which the prepared cream is to be frozen: this cavity, forming a circle within the vessel itself, is open at the top, as represented, and of course closed at the bottom, and reaching very nearly (as the tube in Fig. 1,) to the bottom of the vessel: this secondary part, as likewise represented, fits close, as in Fig. 1, over the vessel containing the freezing mixture. The proportions of the apparatus when together, are thus: the outer space in width, two parts all round; the middle space, or that which contains the cream, one part all round; and the inner space three parts in width,—this serving as a general scale of proportions for an apparatus of any size. The proportions for an efficient apparatus, as my own, may be, for the first space, ten-eighths of an inch (one inch and one-fourth;) for the second, five-eighths of an inch; and for the third space, fifteen-eighths, or rather two inches, making the width of the apparatus itself somewhat above five inches and a half; its height being equal to its width, a projecting rim at the bottom likewise to insulate it from the table. It will be perceived that in the figure there are seven very small holes or apertures in the central part of this cover, (one in the centre and six round at due distances,) just sufficient for the escape of the air, to admit of the ascent of the freezing mixture in the middle part of the vessel. This apparatus is somewhat elevated at the top, or slightly convex, and the part in which the apertures are placed, guarded by a shallow rim to prevent an accidental running over of the mixture into the part containing the cream. This apparatus should be furnished (as expressed in the figure) with an outer cover similar, but less elevated, to the one at Fig. 2. Previously to use, it will be proper to ascertain the quantity of liquid the apparatus will contain when together, and mark its height; likewise the proportion of the ingredients for furnishing a given quantity in measure should be known. Thus, if the three salts are used (which I would

recommend to a private individual, always doing so myself, although these cannot be recovered for future use, but being more efficacious than the two only) for each pint, small or old measure, will be required of sal ammoniac and nitre (each equal parts by weight reduced together into fine powder) six ounces, and of Glauber's salt, in clear crystals and dry, four ounces and a half, freely reduced to fine powder, or kept from the access of air, and in a separate parcel from the former; and water ten ounces, or enough to make up one pint in measure when added to the former ingredients:—of course, the whole must be well stirred together, and expeditiously, before introducing that part of the apparatus which contains the article to be frozen, and occasionally afterwards, till the object is completed, avoiding as much as possible any accidental accession of heat. A freezing mixture composed of sal ammoniac and nitre, with water, all at the temperature of 50°, to which temperature, or nearly so, they may all be reduced by water from a pump by drawing off a sufficient quantity first, will from 50° produce a cold of 22° below the freezing point, and with the addition of Glauber's salt to 28°. The confectioners find a degree of cold at 12° or 15° below the freezing point sufficient for their purpose; but it must be recollected that the cold produced by salts dissolved in water, is not so durable as with ice and salt; the duration of the refrigerating power in the above mixtures, will, of course, be in proportion to the quantity and thickness of the apparatus. In the way the confectioner managed, the mixture in the apparatus retained its freezing property till the morning: my usual way, is, in extreme hot weather, to place the vessel containing the powdered salts in the coldest water drawn from the pump previously; but in the ordinary way it will suffice to add the cold water without the above precaution: it may be adviseable to be provided with a second quantity of the ingredients to preserve the cold by a renewal of the mixture. The drawings are taken from an apparatus of each kind of my own,—they are made of tin, for want here of a fitter material, and are painted outside of a grass green colour. The confectioner abovementioned laid in a stock of a hundred weight of each of the articles; viz. sal ammoniac and nitre; the former at the rate of one shilling per pound, and the nitre at four pence—which, of course, when mixed, was at the moderate price of only eight pence per pound. Glauber's salts may be procured in the large way at the rate of about two pence per pound, and by the single pound at four pence. The apparatus abovementioned may be only half or three parts filled for use; care must be taken in every instance, that the surface of the subject to be acted upon be rather below the surface of the freezing mixture.

For cooling wine, the coldest water drawn from a pump will be quite sufficient; however, if required, a small portion of the cooling powder may be added to the water.

The addition of Glauber's salt, it may be observed, increases the density of the mixture, which then becomes a better conductor of the cold, if I may so express myself, and moreover retains the same temperature longer: of course it will be better of the two to over-

charge than undercharge the proportion of the salts to the water. It will be apparent, for obvious reasons, that the part containing the subject to be cooled should be as thin as may be, and the whole of the external part in every apparatus thick.

This detail may probably appear prolix to any person induced by curiosity only to look it over; but to any one who means to put it in practice, the whole will be found essential, and with a little attention and experience become familiar and easy, and in which I have endeavoured to combine every advantage the subject will admit of; and as coming from the "fountain head," it may not prove uninteresting to some, at least, of your numerous readers. I am, gentlemen,

Your most obedient servant,

RICHARD WALKER.

Oxford, April 28, 1828.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS GRANTED IN SEPTEMBER, 1829.

With Remarks and Exemplifications, by the Editor.

1. For an improvement in the construction and operation of the *Printing Press*, denominated "Booth's Improved Double Printing Press;" Jonas Booth, sen., James Booth, Thomas Booth, Jeremiah Booth, and Jonas Booth, jun., New York, Sept. 1.

In this press the platten is firmly fixed, and the table, or bed, and form, are made to rise up to it, by means of levers adapted to that purpose. The form has no horizontal motion, there being a frame, carrying an inking roller, which passes in between the form and the platten, to ink the former. The sheets to be printed are carried in, and delivered by means of straps, one being carried in, and another delivered, whilst the form is inking. There is no claim, and of course the whole arrangement is intended to be patented. The mode of supplying the rollers with ink, and the structure of some other parts, are such as are well known.

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2. For a *Furnace Cooking Stove*, which may be altered at pleasure into an open stove, similar to a Franklin fire-place, called the "Alterable Cooking and Franklin Stove;" George Richards, Providence, Rhode Island, September 9.

The intention of the inventor of this stove, is to furnish an article which may be *conveniently* transmuted from one form to another, but we apprehend that most persons will object to the removal or addition of a part, or, indeed, several parts of an apparatus of this description, and will deem it *inconvenient* rather than otherwise.

When this stove is to be used as a furnace cooking stove, only, the parts which form the sides of the Franklin, are to be doubled back, whilst the top, with its brass ornaments, and an elbow pipe, are to be removed, and stowed away, together with the furnace and

some other appendages. We do not see any thing in it requiring a more particular description. The claim is to "the peculiar *combination, form,* and construction of this stove, with its *moveable* furnace, *top, sides, mantel piece,* &c. &c.

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3. For an improvement in the *Brick Pressing Machine;* John Woodson, Rockbridge county, Virginia, September 10.

An upright iron rod, is fixed so as to slide up and down in front of a strong vertical post; on the bottom of this rod, is the platten, or follower, which is brought down on the mould containing the brick. The force is applied by hand, to a progressive lever, and the brick is to be thrown out of the mould, by means of a weighted lever, which is made to act under the brick, when the lever of the press is raised. The claim is "the combination of the different parts, the application of the lever power, and the increasing power of the lever."

We do not perceive much of novelty in the arrangement, nor do we believe that any one can sustain a claim to "the increasing power of the lever," when the operation of the progressive lever is so well known, and so frequently employed.

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4. For a new and improved construction of *Vaults and Privies;* Thomas Rundle, Boston, Massachusetts, September 10.

Numerous patents have been obtained for water closets, both here and in Europe, and many of them answer the purpose contemplated in a very perfect manner. The apparatus proposed by the present patentee, as a substitute for them, would require an engraving in order to its explanation, and we are not of an opinion that it merits this expense, as we doubt its practical utility. There is an array of levers, valves, strainers, an air pump, and many other appendages, no particular parts of which are claimed, the whole arrangement being, and we believe justly, considered as new. A very perfect and beautiful model is deposited in the patent office.

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5. For an improvement in the mode of *Covering Houses with Tin-plate, Sheet-iron, or Zinc;* Richard S. Tilden, Lynchburg, Campbell county, Virginia, September 10.

The specification states that "the sheets are to have an edge of about half an inch turned on each side in order to lock them together, and in putting them on the house, one or more clamps, as necessity may require, are used, one end of which is locked in the groove formed by the edging of the sheets, and the other edge is nailed to the sheeting plank, which secures the sheet to the roof."

"What I claim as my improvement, is, the use of the clamps, by which the sheets are made fast to the roof, thereby protecting the nails from the weather, and the possibility of leakage through the nail holes, and differs from the old plan, inasmuch as it prevents the necessity of nailing through the sheets in order to secure them to the roof, thereby leaving the nails in a great measure exposed to the

weather, and the probability of the rain penetrating the nail holes." We do not clearly understand the description given by the patentee, and it does not appear that his specification is accompanied by a drawing of the mode proposed. He speaks of "the old plan," as though but one had been known, and seems to consider it as having been the practice to leave the heads of nails exposed, in both of which assumptions he is altogether incorrect. Perhaps some of our readers may be able to discover the intention of the patentee, and be able to point out that novelty and utility which have escaped us.

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6. For an improvement in the art of *Manufacturing Sugar from Cane Juice;* Ebenezer Avery Lester, Boston, Massachusetts, September 10.

The plan proposed is to employ the discharge steam of the high pressure steam engine, so that its heat shall cause the evaporation of the juice. It is stated that the steam may be conducted, by a tube, nearly to the bottom of a wooden, or other vessel, containing the juice, and discharged directly into it; that in this case, the quantity of moisture will be at first increased by the condensation of the steam, but that the liquid will soon arrive at the boiling point, and the evaporation then go rapidly on. It is proposed sometimes to conduct the steam through the juice, in tubes, similar to the worm of a still, and thus to prevent the contact of the steam and the juice.

When the sugar is to be grained by means of the steam, it is to be put into a wooden, or other vessel, with a double metallic bottom; between which bottoms the discharge steam is to be admitted.

The claim is to "the application of steam in the manner before specified, to the evaporating and boiling of cane juice, and the graining of sugar. Steam never having been thus used for these purposes until my application thereof."

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7. For a *Washing Machine*, and for heating water for the same; Enos D. Cherry, Auburn, Cayuga county, New York, September 10.

A box, or trough, is to be divided into three or four compartments, by partitions extending from one side to the other. In one of these compartments there is to be a stove of sheet-iron, the mouth or opening of which is to pass through the side of the trough, and to be secured to it by flanches. In this stove, surrounded by water, the fire is to be made. Tubes from this compartment may be made to lead into either of the others.

The washing compartment has a circular segment, with grooves, or rollers; upon this segment the clothes are to be placed, when they are to be acted upon by rubbers, or grooved pieces, suited to the lower segment, placed upon a swing frame, operated upon by springs. "The washing machine may be made separate from the boiling apparatus."

There is no claim, either general or particular.

8. For a machine for *Thrashing Wheat and other small Grain;* James S. Wood, Pattensberg, Battetort county, Virginia, September 10.

The cylinder which carries the flails, or beaters, in this thrashing machine, is constructed in a manner very similar to that of many others, the beaters extending from one head of the cylinder to the other; but they are not attached to the circular heads, being fixed on springs, fastened to the centre of the shaft. The floor upon which the grain is to be placed, stands also on springs, although, it is stated, that the machine will answer perfectly well if either part is so fixed, the other being permanent, or stationary. The claim is to this fixing upon springs, which is accounted the distinguishing feature of the instrument.

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9. For a machine for the purpose of *Washing Alluvial Earth, Clay, and Soft Ores,* and separating and saving the gold from the same; William H. Folger, Mechlenburg county, North Carolina, September 10.

A principal part of the apparatus described in the specification of this patent, is called a tipping box, in which the earth, &c. is to be agitated with water, for which purpose the box is suspended upon pivots. There are also described instruments for grinding, raking, and other purposes, which do not appear to us to offer any thing of special interest, or novelty; they, however, are minutely described, and collectively claimed in the following words. "I claim as original the things above described, and the manner of using them, with the exception of the bevel wheels, trundles, and cog wheels, and moving power."

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10. For an improved *Veneering Saw;* A. F. Smith, Salem, Essex county, Massachusetts, September 10.

The description of the invention will be given in due time; the arrangements of the patentee requiring that it should not be immediately published.

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11. For an improved *Auger,* called the "Serpentine Screw Auger;" George Shetter, York county, Pennsylvania, September 10.

The difference between this and the common screw auger consists principally in continuing the circular shank or stem of the auger down through the body of the screw part, as in some cork screws, or, in fact, as in screws in general. The patentee observes that "the spiral, or rim, may be continued on the shaft, or stem, any length, and the auger will bore freely and easily, without drawing it from the hole."

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12. For a *Washing Machine;* George A. Stocking, Aurelius, Cayuga county, New York, September 10.

This machine is very imperfectly described in the specification, and very miserably represented in the drawing; no part of it is claimed as new, and we are, therefore, to take it for granted that the whole is original.

A wooden cylinder, the periphery of which is formed of rollers, is to be turned by a crank; below the cylinder is a spring board, furnished with rollers, and by turning the crank backwards and forwards, the clothes are made to traverse between the roller and the spring board.

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13. For a *Self-adapting Rail-way Carriage;* James Wright, Columbia, Lancaster county, Pennsylvania, September 10.

The specification of this patent will be found at p. 272.

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14. For an improved *Lamp;* Isaiah Jennings, New York, September 10.

The specification, with a drawing, will appear in an early number.

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15. For a *Machine for Planing Timber,* boards, plank, clapboards, window blinds, sash-stuff, cabinet work, tongueing and grooving, straightening the edges, and reducing to a thickness and width, all kinds of wood for various uses; called the "Improved Circular Planing Machine;" Uri Emmons, New York, September 10.

On the 25th of April last, a patent was obtained by Mr. Emmons for a machine for planing, tongueing, &c., which he called the Cylindrical Planing Machine, and which we noticed as being similar to that for which Mr. Woodworth had obtained a patent in December last. In the specification of the present patent, no allusion whatever is made to that previously obtained, and it is, therefore, to be considered as entirely new.

The board, or plank, to be planed, is fixed upon a sliding plank, or carriage, moved forward by a pinion working in a rack on its under side. The plank is to be held down, whilst planed, by rollers which press upon its surface. There is a cast-iron wheel, the diameter of which must somewhat exceed the width of the stuff to be wrought; this wheel is to move horizontally above the top of the board, its edges are furnished with cogs, by which it is to be turned; near its periphery it is perforated to receive four plane irons, or cutters, which project from the lower side, and are fixed and regulated in their places by means of screws. These irons so fixed, cut by a circular traversing motion. The tongueing and grooving is effected by wheels furnished with cutters on their edges, and adjusted to the width of the stuff, motion being given to these by gearing connected with the circular plane. The claim made, is,

"1st. The simple form and construction of the above machine.

"2nd. The principle of a cast metal circular plane.

"3d. The principle of running timber over or under the centre of a circular plane, as above described.

"4th. The driving of the edging, tongueing, and grooving [wheels] by the plane itself, thereby rendering the apparatus simple, cheap, durable, and easily altered, and set, for the different kinds of work.

"5th. The application of the machine to the foregoing and all other purposes to which the same, as before described, may be made to apply."

Among the many patents which have been obtained, here and in other countries, we apprehend that some will be found, which will interfere materially with some of the *principles* above claimed. The first claim must be considered as mere surplusage, as it is altogether indefinite. The term *principle* used in the second and third, is equivocal in its meaning; taken in its most exact acceptation, such a claim would be too broad. We should prefer to read it "the using of a cast metal," &c. and "The running timber," &c. We have seen revolving planes operating very much upon the *principle* of these, but the planes were carried by horizontal arms projecting from a vertical shaft, along side of which the timber was made to pass. We apprehend that the running the timber under the centre is new, the plate being supported by a frame, above the board to be planed. Were the plane made of wood, or of wrought metal, would this interfere with *the principle* of a *cast metal* circular plane?

The grooving wheels appear to resemble those used by Mr. Woodworth, and those also described by Mr. Emmons in his former patent. What is now claimed is the mode of driving them. This claim may be good, if the right to the circular cutters themselves vests in the patentee. We make these remarks, because we are anxious to impress upon those applying for patents the necessity of precision in their descriptions and claims.

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16. For *Making Paper from Straw;* Louis Bomeisler, Philadelphia, Pennsylvania, September 10.

(See the specification, with remarks.)

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17. For an improvement in the art of *Constructing and Building Lime Kilns,* for the purpose of burning lime; Louis Bomeisler, Philadelphia, Pennsylvania, September 10.

Particular directions are given in the specification of this patent respecting the dimensions of this kiln, the height of which is to be about 16 feet, and its greatest diameter nearly 14, its form is egg-shaped. There are no particular points claimed, although several provisions are pointed out which are said to render it superior to other kilns; such as the manner of supplying air to produce a more equable heat, and a more perfect combustion than has hitherto been obtained; it is also said that the mode of building certain parts serves to shelter the workmen who feed and tend the fire. The principal improvement proposed, is, the employment of that heat which is usually permitted to run to waste, and the consumption of that por-

tion of the fuel which is ordinarily allowed to escape in the form of smoke, but which, by a due supply of air, is caused to burn, in consequence of which it leaves the kiln in the form of flame, and is thence conducted into another kiln, or oven, for the purpose of burning brick. The crown of the lime kiln is left open, to charge it with stone, the diameter of the opening being 7 or 8 feet: there is a cap, or cover, to this opening, which is to be lifted on and off by a crane, or sweep; this cap, or cover, has an opening in its centre, of three feet in diameter, to receive a sheet-iron pipe, which is to conduct the flame into the oven, or kiln, containing the bricks; the structure of which is such as to cause the flame to circulate in it in such manner as is deemed most advantageous. The heat which escapes in using twenty cords of wood, the quantity necessary to burn fourteen or fifteen hundred bushels of lime, it is observed, is enormously great; the improved kiln is stated to save this heat, by applying it as above mentioned. The heat thus communicated, will be sufficient to burn such bricks as do not require a greater heat than that which is necessary for the burning of lime, and any additional heat may be obtained by obvious means, if necessary. "The result of this improvement, is, to convert to profit a considerable part of the heat hitherto lost, and to reduce the quantity of fuel necessary to burn lime."

A more particular description would require a drawing; that which accompanies the patent affords but an imperfect representation of the kiln, being merely a rough outline section.

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18. For an improvement in the *Application of Machinery to the Inclined Plane, for Rail-roads and Canals;* Sands Olcott, Hursimus, Bergen county, New Jersey, September 11.

The drawing and description, as given by the patentee, present a rail-road carriage, across the centre of which there is an axle, or shaft, supposed to be driven by a steam engine, which shaft communicates motion to the axles of the carriage wheels by means of drums and chains. When an inclined plane is to be ascended, or descended, a chain reaches from its foot to its summit, being fastened at each end to fixtures in the ground; when out of use, this chain lies upon the ground, and is then called the ground chain. Upon the middle of the main shaft, there is a drum, which, when the carriage travels upon a level, is not in use, but when it is to ascend an inclined plane, the ground chain is to be unfixed, then passed twice round the drum, and its end again fastened to the standard in the ground; the carriage wheels are to be thrown out of gear, and the engine started, the friction of the chain upon the drum will then cause the carriage to ascend. When it is to descend, the chain is fixed in like manner upon the drum, the back and front wheels to be put in gear with the drum shaft, and the steam engine thrown out of gear. The carriage is then to descend by its gravity, its motion being regulated by a brake, acting upon a fly wheel.

The claim is to "the applying the principle of the ground chain,

or rope, and drum, to the use of inclined planes for rail-roads and canals."

The use of chains, ropes, and racks, employed in various ways, is well known to those who have attended to the subject in question, and we are at a loss to discover the peculiar advantage of the plan now proposed. Will a locomotive carriage, which is intended for drawing a train of loaded carriages upon a level road, draw this train up an inclined plane? We wot that the gravitating force would be too great for this, excepting the plane were but little inclined. What is the use of the chain in descending? If the carriage is to descend by its own gravity, what necessity for any thing more than the brake? How is this carriage to be applied on the inclined plane of a canal? This we are not told, and to us it seems that a fixed engine at the top, which had not to perform the labour of carrying itself up, would be more effective than a locomotive engine.

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19. For an improvement in the *Plough;* Thomas Brown, New York, September 11.

The specification begins by saying that "The plough is entirely of iron, and so constructed and put together, as to render it the most easily managed, the most durable, and the cheapest article of the kind ever offered to the public." So far, so good. We however find nothing in the description tending to confirm this enunciation of qualities, as it appears to be like most other ploughs, only that it is made "entirely of iron," with the exception of wooden handles, for the comfort of the ploughman in cold weather. The different parts, we are informed, may be made either of cast or malleable iron. We some time since published, with remarks, some account of a plough entirely of iron.

As the patentee claims nothing, his right is hardly matter for disputation.

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20. For communicating motion to mill, and other works, by *Applying a Water Wheel to the Current of a River*, and for the machinery to effect the same; Joseph Wallace, Hartford, Ohio county, Kentucky, September 11.

A water wheel, made in the ordinary manner, has one end of its shaft supported on a wharf, or bluff, at the side of a river, and in order to communicate motion to the mill, is there connected to a horizontal shaft, by means of a universal joint. The other end of the shaft rests upon a boat moored in the river, at a distance of thirty feet, more or less, from the bank. The boat is retained in its place by arms which extend from it to frame work on the shore; and there is a contrivance for raising or lowering the gudgeon of the shaft in the boat. The claim is to "the mode of communicating motion to the mill and other works, by applying a water wheel to the current of a river, and in the machinery to effect the same, as above described."

The communicating of motion to machinery on shore, by a current wheel, has been frequently done; and we doubt the existence of any thing in the application of the universal joint, upon which to found a claim; perhaps, however, we are fastidious, and others may see invention where we discover variation only.

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21. For an improvement in the manner of *Drawing Water through Forebays*, to be discharged on water wheels; James P. Espy and Andrew Young, Philadelphia, September 11.

Men of science are aware that experiments to ascertain the effect of tubes of different forms upon effluent water, have been performed by Venturi, and others, and that some very remarkable results were obtained. The tubes, or openings employed, are called *adjutages*. At page 280 of the present volume there will be found an investigation of this subject by Mr. Charles Potts; the facts are also noticed in all modern works which treat upon the subject of hydraulics.

The patentees state expressly, that their improvement consists in "applying Venturi's adjutages, and thereby increasing the quantity of water discharged through a given opening, under a given head, and thus increasing the power of the wheel."

We are not aware that the question has ever been decided, whether a claim of this kind is good in law. Patentable objects are "any useful art, machine, manufacture, or composition of matter," "not known, or used before the application;" or any improvement upon either of them; the main question therefore is, whether the application of a well known principle in the production of a well known effect, can be arranged under either of the foregoing heads.

The advantage to be derived by the application of the adjutage in question is to the tenant, or purchaser, of a water right, who is allowed, by his agreement, to draw a given number of inches of water under a given head; by adopting an adjutage somewhat in the form of that given in fig. 7. p. 282, this quantity will be greatly increased.

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22. For *Cast-iron Copings, or Finishing for Chimneys*, fire guards, ridges, &c. of buildings; Charles Neal, Waterford, Saratoga county, New York, September 11.

It is altogether unnecessary to give a description of either of the above articles, as the claim is to "making the above described copings, or finishings for buildings, of cast-iron, instead of other materials, as heretofore used; and also the peculiar construction of the same as above described."

The *peculiar construction* alluded to, is the provision that they may be cast either in one or more pieces.

We have repeatedly given an opinion that a claim like the above is not good, as it consists merely in a change of the material used, and cannot be properly denominated either an invention or discovery. Were we to build a house of cast-iron, should we interfere with the

rights of the present patentee, because our chimney tops, and other finishings, were of that material?

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23. For improved *Iron Hubs for Carriages;* Hercules Thomas, Middleborough, Plymouth county, Massachusetts, September 11.

There is a want of clearness in the description of this hub, or nave, which is not removed by the drawing; the main object appears to be to fasten the wooden spokes firmly, by screwing a nut upon one end of the hub, which acting upon a sliding collar, presses the spokes between flanches or cheeks, projecting out for that purpose. Upon the inner edge of these cheeks are "processes," projecting angular pieces, to notch into the spokes; and between the bottoms of the spokes "processes" project to steady, and keep them in their places.

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24. For a *Fly Net*, for saddle, gig, or carriage horses; Henry Korn, Philadelphia, September 12.

This net in its construction resembles the well known leather thong nets. "The net is constructed with three longitudinal straps of cotton, worsted, or silk, either woven, plaited, or braided; the ribs, or thongs, are woven, plaited, or braided, into the longitudinal straps, at right angles, and in a durable manner; the cord used for the ribs, or thongs, is substantial braided cord, far superior to twisted, or other kind of cord."

The utility of this net is said to consist in its being light;—easily kept clean;—being of substantial materials;—that, its colour being bright, it will attract the flies, they preferring it to the darker skin of the horse;—its lightness will tend to keep it in motion;—it may be fixed and removed very readily;—the coloured cotton may be easily washed;—the white cotton, worsted, or silk, easily dyed; the comfort of the horse, and the safety of the rider, will be promoted.

There is no claim; a drawing accompanies the specification, but is not referred to.

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25. For an improvement in the *Machine for Cutting Pannels for Carriages, and other Work, and Veneers*, around, or off, the circular surface of a log; Job White and Phineas P. Quimby, Belfast, Waldo county, Maine, September 12.

On the first of May last, a patent issued to Caleb B. Burnap, of Belfast, Maine, for a machine for cutting veneers in one continuous sheet, around a log. We have since seen specimens of the veneers so cut, which were perfectly well executed. We believe that the claim of Mr. Burnap was to the machinery employed by him, only, and not to the cutting around the log, although we think such a claim might have been sustained. The present patentees use circular saws, but turn them and the log, and also give the traversing motion by machinery constructed differently from that of Mr. Burnap.

Their claim is to "the application of the circular saw, in the manner described by them;—to the combination of the machinery, whatever its position;—and to the raising of the gate, so as to permit a greater flow of water in order to increase the crank motion, as the log diminishes in size, by means of a screw, gearing, or lever, attached to the machine."

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26. For improvements in the common *Water Pump;* John Washington Hillias, Baltimore, Maryland, September 16.

The improvements here patented are intended to prevent the introduction of stones or other hard substances through the spout of the pump, or through the slot in which the handle works; and for a better mode of fastening on the head of the pump than that of nailing.

Sliding pieces are fixed in grooves, and pressed forward by springs, so as to close the slot, or mortise, in which the handle works; and a valve, opening outwards, is applied within the spout, to allow of the exit of water, and prevent the introduction of foreign substances. The head of the pump is to be fixed on by spring catches, and staples. These are the improvements which are claimed.

The heads of pumps are not every where fixed by nailing; we have repeatedly seen them fixed by staples, hinges, and locks. We some years since contrived a mode of effecting the principal object above proposed, the preventing the introduction of stones, &c. which we will some day describe.

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27. For a machine for *Planting, and Preparing Seeds for the same;* Zebina Lane, Harrisburg, Lewis county, New York, September 21.

The specification of this patent is of considerable length, and describes the machine without reference to the drawing, and although evidently written with much care, is not, alone, very intelligible. The drawing is miserably executed; the details of the apparatus cannot therefore be understood without the devotion of more time than we can at present spare. At page 343, vol. 2, of the new series, a planting machine is described, which was invented by Messrs. Robbins, of Lewis county, in New York; and to us it appears that the machine now patented, is the child of the former; how near the resemblance may be, we are unable to state, for the reason already given.

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28. For an improvement in the *Manufacture of Harness Trimmings, and Carriage Ornaments;* William S. Robinson, Taunton, Bristol county, Massachusetts, September 22.

The improvement proposed is the making of metallic furniture for harness, or coach ornaments, by using a composition of metal, resembling Brittania metal, and the casting them in brass moulds, so as to require but little finishing; as it is not pretended that the

recipe for the composition is a new one, we insert it. A composition is first made, called hardening: this is formed by melting together three pounds of copper, seven pounds of block tin, twelve ounces of antimony, and twelve ounces of bismuth. Seven pounds of this, melted with thirty three of block tin, form the metal in question. The claim is as follows:

"That which I claim as new, and as my invention, is the application of the above described composition of metal to the manufacture of harness and carriage trimmings, in those cases where silver plated work has been heretofore used; and likewise the manufacture of said trimmings by means of moulds, whereas the common trimmings are cast in sand, and cannot be cast in moulds;—but I do not claim as new, the composition of the foregoing ingredients into one metal, since a metal has been before manufactured from the same ingredients, though used in different proportions; nor do I claim the invention of the moulds, which are made of common materials, and in the usual way, but which have never been used before for a like purpose."

That is, although buckles, beads, and ornaments of various kinds, have been frequently cast of a similar metal, and in similar moulds, an exclusive right to the casting of buckles, beads, and ornaments for harness and coaches, is claimed by the present *inventor*.

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29. For *Manufacturing Perpetual Polished Water-proof Boots and Shoes;* John Ryan and John Haskins, of Boston, and Samuel Known, of Roxbury, Norfolk county, Massachusetts, September 23.

The whole specification is as follows:

"This improvement in the manufacture of boots and shoes consists in the application of *japanned water-proof leather* (such as has heretofore been used for caps) to the manufacture of boots and shoes, so far as regards the *upper* leather of boots and shoes, and the insertion of a *layer* of said japanned leather between the *outer* and *inner* sole; by which means the whole boot or shoe will be perfectly tight, and will exclude the water entirely. And boots and shoes made according to this invention will be superior to all others for durability, beauty, usefulness, and cheapness, by being *water-proof*, continuing always clean, and polished, and handsome, without expense of blacking or other process usually adopted for this purpose."

We think this patent in the same *category* with cast iron hammers, cast iron chimney tops, or cast iron horse shoes. We apprehend that the making of shoes of a kind of leather well known, and long used, cannot be taken as an *invention* or discovery. Is it not also a little remarkable that the stocking loom should be the production of "one poor scholar's brain," whilst it required the talents of three gentlemen to invent, or discover, that shoes might be manufactured of japanned leather.

30. For an improvement on the *Machinery for Bending Wagon Tire*, hoops, bands, &c.; Josiah Butler, Cobleskill, Schoharie county, New York, September 24.

The specification is in the following words:

"Instead of having the upper roller regulated by boxes and screws, above and below, as those in use are, it is regulated in the following manner, that is to say, the roller on the improved plan runs in two perpendicular iron standards, passing through the bench, or platform, on which the under rollers are placed. These standards, in which the upper roller runs, are lowered, or raised, by means of nuts and screws working on the iron standards above and below the bench or platform. By this method of setting the upper roller, the machinery is rendered less complex, and may be built with about half the expense, and with equal power and durability."

Specifications of American Patents.

Description of a new mode of applying the power of men to cranks, for turning paddle wheels, and for other purposes; and also for a rudder to be applied to the bow, and of warps to the keel of a ship or other vessel, for the purpose of diminishing lee-way. Abstracted from a patent granted to Adolph Heilbronn, *of New York, March* 16, 1829.

(with a copper-plate.)

The obtaining of the greatest power, or force, from man, for turning the improved paddle wheels, (described p. 194,) or for other purposes, is proposed to be effected by compound cranks, to be operated upon and turned by the hands, and the weight of the body, at the same time, the feet being applied to treadles properly placed and connected to the cranks. Figures 1 and 2, of plate V, are views of the cranks, QQ being the bearings, or pivot, upon which they turn. Figure 1 is a crank to be worked by the simultaneous motion of both the hands of a man moving in the same direction, and figure 2 is a crank likewise for both the hands, but by which greater power is gained; because now the hands move in opposite directions, and oppose each other's force. In figure 1, both the hands are to be applied to the straight bar H; and I, J, are two treadles like those of a foot-turning lathe, each treadle being separate, and hinged to the floor, or to proper framing.

Each treadle is connected by a connecting rod or strap *ll*, as in a lathe, to the two smaller cranks above them, marked K, and L, which form part of the large crank, and are bent in the same plane with it. The person working the machine stands upon the treadles, his left foot being upon the treadle I, and his right foot on that marked J, consequently his whole weight is transferred to them. When, however, he transfers the weight of his body on to one leg only, one short crank will be pressed down, and the other will be at

liberty to rise. In the mean time, the power of his two hands is to be applied to the bar HH, to urge its descent, until it reaches its lowest point, at which times, the short crank K will be in its most elevated position, and after passing the top centre line will begin to descend, at which moment the pressure of the right foot upon the treadle J must be released, and the whole weight of the body thrown upon the left foot and treadle I, while the two hands employed in raising the bar HH, from its, now, lowest position, and so on until the said bar arrives at the highest position in its rotation, when the weight of the body must be again thrown on to the treadle J, and so on alternately. The crank shown in Figure 2 is the same in principle as Figure 1, but is to be preferred for more powerful action, being stronger, because it has a central bearing at QQ, in addition to its two end ones; and instead of the two hands moving constantly in the same direction, the left and right hand cranks are diametrically opposite to each other, consequently when one hand is down the other will be up; and while one is pushed forwards, the other must be drawn inwards, and vice versa; consequently whenever one arm is pushing, the other will be pulling in an exactly opposite direction; from which circumstance a much greater degree of strength and exertion can be used than in other positions of the body. The short, or foot, cranks in this figure are, each of them, opposed to the longer, or hand, cranks, and are to be connected to treadles as before described, and to be used in the same way. This improvement is equally applicable to a sitting position, like that of rowing a boat, as shown at Figure 3; which shows one of the means by which this action may be brought about; *a*, *b*, *c*, being a crank like that shown at Figure 1, *c* and *f* the treadles, now fixed in a vertical, instead of a horizontal, position, and *gg*, the connecting rods when the large crank is in its upper position and is to be drawn inwards, or towards the body of the man at work, the operation, excepting as to direction, being similar to that already described.

In order to prevent ships and vessels of all kinds from making so much lee-way, as they usually do, an apparatus, partly in the nature of a rudder, is applied to the head, instead of the stern, of the vessel, but differently worked; and certain additions are made to the keels of vessels, which may be used either together or separately. The new head rudder is to be fixed to the head of the vessel in the same manner as a common rudder is fixed to the stern, or in any other substantial and convenient way. The common rudder is worked, and acts, as usual; the only difference between the head rudder and the common rudder is, that the common rudder requires to be very frequently moved by the helmsman, while the head rudder is much more stationary, seldom requiring to be shifted in its position, and that principally when the vessel moves upon a new tack, or has any alteration made in the position of her sails. Figure 4 is a representation of the plan of a vessel fitted with the head rudder; A is a tiller placed over said rudder, instead of behind it, and moved by the side tackles B and C, and are kept steady by the tackle D, which leads from the bowsprit. With a view to produce a still greater

resistance to the wind, certain contrivances are applied to each side of the keel of a vessel, which are called keels of resistance, or wings, and are shown at Fig. 5.—These wings may be made of solid wood, cork, or such like light material, but making them hollow, and of cast iron, or other metal plates, in such way that the water may flow through them, is preferred, in which case they are denominated keel tubes. Fig. 5 shows a vessel in an inclined position, and *i*, *j*, *k*, *l*, is a section of the keels of resistance, or wings, which are applied to both of the sides of the ordinary keel of the vessel, in such form and manner, that when the said vessel lies gunnel to, the side *i*, of the keel of resistance, may stand just perpendicular to the horizon, and consequently in the most favourable position for resisting the passage of the opposing water under the vessel, which is, of course, taking the direction shown by the arrow, and, if it were not for the wing, would pass away without any material interruption. Under the vessel a resisting keel is placed on each side, because when the vessel keels in an opposite direction, the face *k*, of the other resisting keel, would be opposed to the water; the resisting keels, or wings, when made of thin cast iron, or other metal plates, have their insides hollow, and being open at both its ends, the water will pass through them with very little additional resistance to the vessel, particularly if such keel tubes are made of wrought iron or copper plates.

Specification of a patent for making from straw, white and handsome Writing Paper. Granted to Louis Bomeisler, *Philadelphia, September* 10, 1829.

Be it known that I, the said Louis Bomeisler, have discovered and invented a new and useful improvement in the manufacture of fine white writing paper, or composition of matter, or material, for making paper from straw, which I specify in the words following, viz. Take one hundred and twenty pounds of straw (after the knobs are cut off) and put it into a boiler, by layers, on which strew thirty pounds of lime; boil the whole down in water until the straw is nearly reduced to fibres, after which take it out, wash, and press it, in order to clear it of the water. The second operation is a mordant for extracting from the straw the silicious and glutinous matter (which would be injurious, and cause the paper to crack,) which is made as follows, viz. for every two and a half pounds of straw, take one pound of sulphur and three pounds of lime, and twenty-four pints of water, consequently, for 100 lbs. of straw it will require 40 lbs. of sulphur and 120 lbs. of lime, to be put in a boiler and boiled until the sulphur is scarcely perceptible, and until the liquor has a handsome brown colour, resembling strong beer; after which, it is to be removed into a tub sufficiently elevated, in order to draw off the liquor clear, which let run upon the straw; in which situation it must be left for about fifteen hours, when the straw is to be taken

Fig. 1.

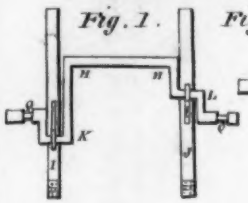


Fig. 2.

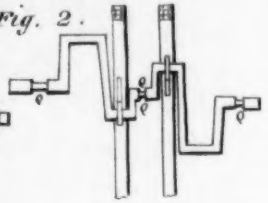


Fig. 3.

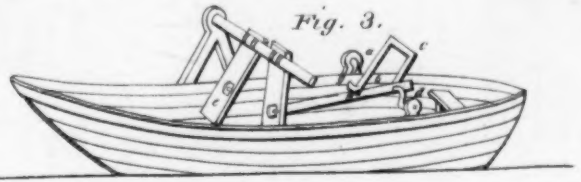


Fig. 4.

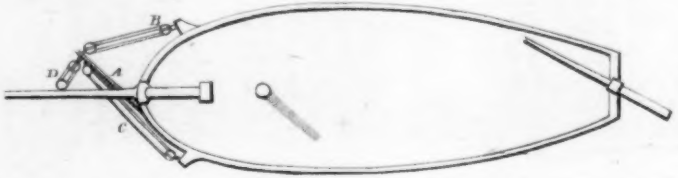
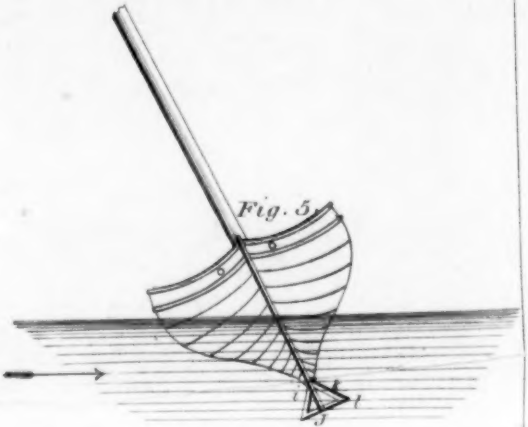


Fig. 5.



out and washed, in order to prepare it for being whitened or bleached, which is the third operation. After the straw is well washed and pressed, it must be spread out in a box, or recipient, for the purpose of being whitened, which is done as follows, viz. twenty-five pounds of magnesia mixed with fifty pounds of salt, thirty pounds of sulphuric acid, and twice its weight of water; divide the whole into several retorts fitted with tubes for introducing the contents into the box where the straw has been strewed; for the purpose of digestion twelve hours will be necessary, by which time a pap, or pulp, will be produced, fit to make fine white and handsome writing paper, with which pulp proceed in the same way as adopted by the paper manufacturers for making the pulp into paper.

The foregoing is adapted for the making of 100 lbs. of pulp, from 120 lbs. of straw, after the knobs are cut off; my improvement therefore is on making, from straw, fine white and handsome writing paper, not heretofore known or used.

LOUIS BOMEISLER.

Remarks by the Editor. In the first volume of this Journal, page 92, we published an account of a patent granted to Louis Lambert, a French gentleman then residing in London, for accomplishing the same end as that above described, and that by the same means. This publication was made by us in February 1826; the patent was then several months old in England, and had been previously secured in France. To show the *absolute identity* of the two, we will extract a large portion of the article alluded to, as many of our subscribers have not our first volume in their possession:

"First procure a quantity of straw, and cut away all the knots; the straw is then to be boiled with quicklime, in water, for the purpose of extracting the colouring matter, and separating its fibres. When this is done, it is to be washed in clean water, in order to remove the colour that has been extracted, and also the slaked lime. The fibrous substance is then submitted to the action of a hydro-sulphuret, compound of quicklime and sulphur in solution, in the proportion of four ounces of quicklime to one of sulphur, with one quart of water, in order to get rid of the mucilaginous and silicious matters. After this the fibrous material must be thoroughly washed in successive waters, until all the alkaline matters are removed, and there is no smell of the sulphur left. It is then pressed to extract the water from the fibres, and bleached in the ordinary way, either with *chlorine*, or with lime, or by exposure to the light and air upon a grass plat. The bleaching process being completed, it is to be introduced into the ordinary rag engine, for the purpose of rendering it to pulp, previously to moulding it into sheets."

To those of our readers who are not acquainted with chemistry, it may be necessary to say that the salt, manganese, [not *magnesia*] sulphuric acid, and water, spoken of by Mr. Bomeisler, are used for the purpose of procuring *chlorine*, by which the bleaching is effected. Mr. Bomeisler has made no claim, excepting to "the making from straw, fine, white, and handsome writing paper, *not before known* or

used." That it was before known, is manifest; that it has been used, is also certain; but we are informed that its texture was not such as to enable it to compete with the paper made of the usual materials.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Vis Inertiæ.

Is there, or is there not, such a property in matter? While certain practical writers deny it, as a thing absurd and totally unwarranted by any thing in nature, other writers, mechanicians, and metaphysicians, still hold to it, and go so far as frequently to make it the foundation to some hypothesis, in reducing natural or mechanical effects to their causes; when, perhaps, the latter might, by a little common-sense-investigation, be established in ordinary principles of science. And too often subtle casuists do appear to choose to involve natural effects in such mystery, the rather, perhaps, that they may thereby, in drawing them out from such a source, unfold therewith some of those finely spun theories which will appear plausible enough and fair enough abstractedly, till we come to follow them up into the labaryntheal obscurity of their origin.

Our good old doctor Franklin, for one, was too much a matter-of-fact-man, to see in nature a *vis inertiæ*, "that obstinate power by which a body endeavours, *with all its might*, to continue in its present state, whether of rest or motion." If the *vis inertiæ* had been defined *merely* as that "*obstinate power*," by which a body is *made to continue* in a state, whether of rest or motion, measured by its weight in the one case, or by its weight multiplied into its velocity in the other, the old doctor would unquestionably have admitted its existence in the same breath with that of gravity and momentum.

I should like to see satisfactory answers to the following questions.

1. If the aim or end of all science be truth, is it not essential that the principles of investigation should be *established* truths?

2. If so, are not error and uncertainty in these principles inadmissible?

3. Why then is one of these principles suffered to remain *subjected* to both of these charges?

It may be answered by the believers in a vis inertiæ, that although satisfactory to themselves, the truth of the existence of such a power in matter, or the *necessity* of resolving certain principles in physics to its agency, *is not demonstrable.*

We hope the advocates of the *vis inertiæ* will excuse our want of courtesy, if without waiting to see if they *can* produce proof of its entity, we proceed, as we conceive, to demonstrate its *nonentity.*

First. A ball, stationary, being struck by another ball of equal weight and magnitude, moving with a force equal to F, both balls shall move on with a force equal to $\frac{1}{2}$ F. Where is the *vis inertiæ* in the ball struck? It may be answered thus: that it was *consumed* in opposing the *vis inertiæ inherent* in the ball moving, and by which

that ball resisted any power tending to stop it, with a force equal to that exerted, in overcoming the *vis inertiæ* of the ball struck. That is to say, then, that the *vis inertiæ* is *destroyed*, that it *no longer exists* in these balls. Let us now suppose one of these *negative* balls proceeding with its force $\frac{1}{2}$ F, strikes another ball, stationary, of the same size and weight, What is the consequence? Why both balls proceed to move with a force equal to $\frac{1}{4}$ F. Do they not? *Then, with* or *without* a *vis inertiæ the effect is the same.* As we can only judge of any power by the effect which it is capable of producing, where there is a *non*-entity of *effect*—it is vain to look for *entity* of power. But supposing we have gone too far in saying that in the latter case, above, the *vis inertiæ ceases to be an active principle* in the ball moving, it only the more directly establishes our final inference. For if the forces after each impulse are divided into $\frac{1}{2}$ F, $\frac{1}{4}$ F, and so on, would they not be so divided if there were no such thing in nature as a *vis* inertiæ? Here we again encounter the horrors of our original dilemma, which again throw us immediately upon the same conclusion, that nonentity of effect is equivalent to nonentity of power. And further, let us follow up this *division* of forces, and see where it leads us. If it be necessary, in the first place, to defend the existence of the vis inertiæ, to admit that the principle is *inherent*, and continued in every mass of matter, whether stationary or moving, and that the counteracting forces in those cases when *first* opposed, destroy each other, and that *thence* it is that no visible *effect* is produced; then of course we may continue to make *theoretically* in the instance of the balls continually communicating the original impulse, an *ad infinitum* division of forces, without ever arriving at a point where the vis inertiæ shall exert itself, or cause a cessation of action. How then can we contend for the existence of such a *power* in nature?

Let us consider it in another light. No one who contends for the *vis inertiæ*, we presume, refuses to admit that the standard whereby is to be estimated the quantity of this power, existent in any mass of matter, is the gravity of that matter. Now it is an axiom in theoretical mechanics, that the greatest conceivable mass of matter may be moved by the least conceivable force. Suppose then that it were required, by means of a lever, to overcome a weight of 1,000,000 lbs. by a weight of 1 lb. Now, if the lever were inflexible, the fulcrum a point, and friction nothing, would the long arm of the lever for that purpose require to be more than 999,999 times the length of the shorter arm? Where then is the vis inertiæ in the larger mass? The only answer to be made here, is, that the *vis inertiæ* being a property inherent in all bodies, all principles in mechanics, where matter is considered, necessarily involve the consideration of the vis inertiæ. But this is taking a new ground entirely untenable, and is at once paramount to denying the existence of a certain principle in matter, independent of gravity and opposed to motion, acting with a certain power, to be considered abstractedly in mechanical effect, with friction, &c.

If then our deductions are correct, if this principle is *not shown*,

nor cannot be proved to exist, either theoretically or practically, by any *effect produced* in the determination of matter acting under the *established* laws of nature, then a power having no effect is a practical, if not a logical absurdity.

Let scientific gentlemen, therefore, explode a term from their writings which is unmeaning, and only tends to obscure science and lead to erroneous conclusions.

I shall take the liberty of closing this communication, by quoting the following extract from a letter of Dr. Franklin's to Mr. Hopkinson, which gives a case in point, and which I think is very happily conceived.

"Suppose two globes equal to the sun and to one another, exactly equipoised in Jove's balance—suppose no friction in the centre of motion, in the beam or elsewhere: if a moschetto then were to light on one of them, would it not give motion to them both, causing one to descend and the other to rise? If it is objected that the force of gravity helps one globe to descend, I answer, the same force opposes the other's rising. Here is an equality that leaves the whole motion to be produced by the moscheto, without whom these globes could not be moved at all. What then does *vis inertiæ* do in this case? and what other effect could we expect *if there was no such thing?* Surely, if it were any thing more than a phantom, there might be enough of it in such *vast* bodies to annihilate so small a force by its opposition to motion!"

A subscriber, and lover of truth.

A. A. D.

Chesapeake and Delaware Canal Line, Sept. 28, 1829.

Elasticity, Ductility, and Strength of Hammered and Rolled Iron.

The following are the principal results obtained by M. Lagerhjelm, with great care, and the use of a very complete and powerful apparatus:—

1. Rolling always gives the same iron the same uniform density. Hammered bars of the same iron are often of different densities, and frequently contain scales. 2. Rolling does not twist the fibre of the bar: hammering sometimes does. 3. The measure of elasticity is the same for both hammered and rolled bars; but the limit of elasticity (measured by the greatest weight which the bar can support for a given sectional surface, without any permanent change of form) is greater for hammered than for rolled bars, if neither have been refolded; but if they have been refolded, the limit of elasticity is increased, and becomes the same for both. 4. Rolling gives more ductility to iron than hammering. 5. Cohesion appears independent of the process employed, and is the same for both. 6. The lengthenings and shortenings (both of which follow the same laws) are not proportioned to the forces which draw or compress a bar of iron in the direction of its length. 7. Elasticity is not changed by tempering. 8. Very different forces are required to produce the same per-

manent change of form in a brittle and a soft iron. 9. The limit of ductility being taken as the length which a bar a foot long will increase by, from the state of unaltered elasticity until the moment of rupture, the most ductile iron experimented with was found to give for its limit of ductility 0.27 of the original length, and 0.722 of the original section. 10. The cohesion is the same for brittle or soft iron, fibrous or not fibrous: so that the absolute strength of iron appears to depend upon its ductility. 11. The volume of the metal increases as the bar is drawn apart; and the specific gravity of the iron at the broken surface is less nearly by 0.01 than that of the same iron taken from an unaltered part of the bar. 12. When the iron is extended, preparatory to its fracture, heat is evolved: the heat is greater for soft than for harsh iron. Sometimes a bright spark appears at the moment of rupture.

[*Bull. Univ.* E. x. 42.

Smoke Disperser of M. Millet.

A REPORT upon this apparatus, made by M. Derosne, speaks favourably of its powers. The apparatus is simple, consisting of a kind of tub pierced with a great number of holes, having the burs outwards. It has been taken into practice by many persons. In order to prove its efficacy, one of them was fixed on the top of the funnel pipe of a stove, and a very close, smoky fire made below. By means of a ventilator, an artificial wind was then made to strike directly and powerfully on the smoke disperser for the purpose of driving the current downwards and making the stove smoke; but neither by this, nor even additional means, could any effect of the kind be produced. The committee could not explain the effect, except by supposing that the cylindrical form of the apparatus presenting only a small surface to the action of the wind was favourable, and that the form of the small apertures in this cylinder, occasioning a great number of contrary currents, produced almost a perfect neutralization of the force of the wind. Whatever may be the cause, the apparatus offers a cheap and effectual remedy for smoky chimneys, when this fault in them is dependent upon the pressure exerted by winds upon the upper aperture of the flue.

[*Bull. Soc. Enc.*

Indelible Ink, or Dye. By M. BRACONNOT.

WHILST engaged in experiments on the production of deep brown colours for dying, at an economical price, MM. Braconnot and Parisot were led to examine the nature of the products obtained by the calcination of various organic substances with potash. These results were found to vary with the substances used: thus, when matters containing but little azote were employed, only little colour could be fixed upon fabrics, and that easily removable by alkaline solu-

tions; but when such substances as flesh, skin, and horn were employed, more permanent and deeper colours were obtained. Suspecting that this difference might be due in part to the sulphur present in these bodies, sulphur was purposely added, and then a deep chesnut brown dye was procured, more permanent than any other of the kind known in the arts. This immediately led to the preparation of an indelible ink, which was prepared in the following manner:—20 parts of Dantzic potash were dissolved in boiling water, and 10 parts of tanned leather parings, in small pieces, with five parts of sublimed sulphur, added; the whole was boiled to dryness in an iron vessel, then heated more strongly with continual agitation, but avoiding ignition, until the whole became soft; then a proper quantity of water was gradually added, and the whole filtered through a cloth. In this way a very dark coloured liquor was procured, which may be preserved for any period in close vessels, and which ought to be retained in well corked vessels, constantly excluded from the air; this presents no difficulty to its use, for a pen full is sufficient to write a couple of quarto pages. It flows much more freely than ordinary ink, does not embarrass the pen with insoluble matter, and resists chemical agents in such a way as to merit the title of indelible ink.

Paper written with it, when subjected to the action of a boiling solution of potash, or strong sulphuric acid, or strong nitric acid, was nearly destroyed, whilst the characters remained unimpaired. Being first immersed in a mixture of chloride of lime and muriatic acid, and then for twenty-four hours in caustic potash solution, which was ultimately boiled to dryness, still the letters were very distinct. Weaker actions than these could of course do no harm, stronger could hardly be devised.

It is presumed that the same preparation will be found very useful in giving chesnut browns, more or less deep in colour, to cotton, hemp, flax, and silk; or to assist other substances in producing colour. Substances tinted by a salt of iron take a deeper tint from this preparation than those not so prepared. It is also proposed to use it upon linen as an indelible ink.

[*Ann. de Chimie*, xl. 221.

NOTICE.

Several original articles intended for this number, have, unavoidably, been crowded out. Among them are the papers of Mr. Potts and Mr. D. H. Mason, read at the monthly meeting of the Franklin Institute. Observations on Mr. Perkins' new Paddle Wheel, and Mr. Thorp's first description of his improvement in spinning cotton. They are in the hands of the printer, and will appear in the next number.

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